RAILROAD GAZETTE

ESTABLISHED IN APRIL, 1856.

PUBLISHED EVERY FRIDAY BY THE RAILROAD GAZETTE AT 83 FULTON STREET, NEW YORK
BRANCH OFFICES AT 375 OLD COLONY BUILDING, CHICAGO, AND QUEEN ANNE'S CHAMBERS WESTMINSTER LONDON

EDITORIAL ANNOUNCEMENTS.

THE BRITISH AND EASTERN CONTINENTS edition of the Railroad Gazette is published each Friday at Queen Anne's Chambers, Westminster, London. It consists of most of the reading pages of the Railroad Gazette, together with additional British and foreign matter, and is issued under the name Railway Gazette.

CONTRIBUTIONS.—Subscribers and others will materially assist in making our news accurate and complete if they will send early information of events which take place under their observation. Discussions of subjects pertaining to all departments of railroad business by men practically acquainted with them are especially desired.

ADVERTISEMENTS.—We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay, EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and these only, and in our news columns present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers, can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.*

CONTENTS

EDITORIAL:
- Brooks Adams on Government Regulation 317
- Correspondence Schools 317
- A Phase of Railroad Bonding..... 318
- Electric Systems for Heavy R. R. Service 318
- February Accidents 319
- Grade Crossings in Massachusetts. 319
- Another English Automatic Signal Overrun. 319
- Delaware & Hudson 320
- Michigan Central 320
- Wheeling & Lake Erie 321
- Trade Catalogues 321

ILLUSTRATED:
- Rebuilding the Housatonic River Bridge; N.Y., N.H. & H., at Sandy Hook, Conn. 323
- Interlocking on Lackawanna at Roseville 330
- The Engineering and Maintenance of Way Association Convention. 332
- Automatic Signals for the Union and Southern Pacific 343

CONTRIBUTION:
- Cab Arrangements on Electric Trains... 321
- Shavings Cut from the Rail. 322

MISCELLANEOUS:
- President Mellen on the Hepburn Bill.. 322
- Washington Correspondence 323
- Alternating Current Electric Systems for Heavy Railroad Service..... 327
- Iowa, Vermont and Prussia 329
- Exhibits at the M.-of-W. Convention.... 341
- Investigation of Concrete Materials Under National Board on Fuels and Structural Materials 342
- Standard Locomotives for India 342
- Train Accidents in the U. S. in February 343
- The Hungarian Railroad Strike (Note).. 344

GENERAL NEWS SECTION:
- Notes 93
- Obituary 95
- Meetings and Announcements..... 95
- Elections and Appointments 95
- Locomotive Building. 96
- Car Building 96
- Bridge Building 97
- Railroad Construction 98
- Railroad Corporation News..... 100

VOL. XL., No. 13. FRIDAY, MARCH 30, 1906.

A rigid long-and-short haul rule and a law to prevent stock-watering are the two principal elements in the remedy for railroad evils proposed by Mr. Brooks Adams in the *Boston Transcript*. Like Dr. Hadley, Mr. Adams states his position rather briefly, not giving all his reasons and not touching on all of the difficulties, but, like Dr. Hadley, he also takes a calm view, recognizing that compromise is necessary—and not only necessary but exigent. He shows in very clear terms how the courts have uniformly taken that position which favors vested interests, while the Commission has as uniformly taken an opposite one; has tried to make progress by dealing out justice even at the expense of costly departures from traditional practices—which sufficiently explains the strenuous endeavors of most capitalistic interests to keep all questions within the hands of the courts as far as possible. "Stock-watering" is used as a broad term to include stock-fattening as well. In other words, Mr. Adams would forbid stock dividends and other devices by which the earning power of a railroad is concealed from all except experts until ownerships have been so juggled that the public finds itself powerless to prevent exorbitant profit taking to pay unreasonably high dividends. By compelling a railroad to pay its profits to the stockholders in dividends, or else to show the public where the money is put, or what is being done with it, he would endeavor to keep the public so well informed that excessive rates would be readily discoverable. At present it is usually impossible to know whether rates are exorbitant or not until it is too late to give the public any adequate relief by legislation or other state action. Mr. Adams' plan is not without reasonableness. With intelligent management it would undoubtedly aid in hastening that practical degree of publicity that all fair-minded students and critics desire. The enforcement of the long-and-short haul rule everywhere would, of course, work much injustice, at least for a time; but Mr. Adams could plausibly claim that the change only shifted the burden from the oppressed to the oppressor. Nobody, however, could devise such a law which would not have to be subject to exceptions; and there's the rub: Where is the wise and powerful body to supervise the allowance of exceptions?

While Mr. Adams' article is neither conclusive nor novel, it is valuable for the clear insight manifested, and therefore we give it this notice. It is too solid to be abstracted; it must be read. It is also of interest from its local viewpoint. Being a New Englander, the author gently reminds his neighbors that they have been too short sighted and provincial. They have not exercised the commercial common sense which would have dictated an appeal to Congress for the remedy now suggested. Instead of being commercial, New England is—capitalistic, though Mr. Adams does not directly say so. The railroad investors, rather than the shippers and manufacturers, control public sentiment there. Finally, Mr. Adams gives a clarifying view of the "court review" perplexity. On this he says:

> As the vested interests resisted all relief, the President had to do what he could, not what he would. The Hepburn bill is confessedly imperfect, but all men can understand a proposal to erect a tribunal which shall have power to correct an unjust rate, while the intricacies of the automatic system of the long-and-short haul are popularly inexplicable. Furthermore, the vested interests clearly prefer to take their chances with a new statute which the Supreme Court may emasculate. . . . All lawyers know that a court can emasculate any new statute at pleasure, but courts are usually careful not to exasperate society at large. To do so would be fatal to themselves. The Hepburn bill presents an alternative. Either it purports to prevent a judicial review of the Commission's decisions, or it does not. If it cuts off review it may be held unconstitutional for depriving citizens of their property without due process of law; if it does not, it would be impossible to limit the extent of the review against the will of the judiciary. Take, for example, the plea of confiscation. Ames vs. Union Pacific has established that any reduction, however small, in gross receipts, which carried out logically might impair dividends and thereby injure values, may be confiscation; while Calloway's case decided that rates calculated to return 6 per cent. on actual investment, and 6 per cent. on water—12 per cent. in all—beside a surplus, had in them nothing intrinsically unreasonable. Hence it might be inferred that any equalization which tended to reduce dividends below a 12 per cent. basis would unreasonably diminish the value of the property, and be confiscation. To determine this fact the Court would be obliged to consider both law and evidence. . . . Few lawyers assume that a constitutional act of Congress can certainly bar a judicial review. A statute which should unconditionally subordinate all the functions of the Commission to court review would be assumed to be an approval of the law as it now stands. Under such a statute the judiciary would feel itself strengthened, and no relief would follow. The privileges of vested interests would be maintained or even extended. Conversely, an enactment which purported to limit the judicial review, and to place responsibility on the Commission in preference to the Court, would be interpreted as disapproval of the attitude of the Supreme Bench, and an expression of a demand for a more perfect equalization of the transportation tax. . . .

"The Character of Correspondence School Teaching" was the subject of a recent editorial in the columns of a contemporary, wherein, in answer to many inquiries regarding the character of such instruction, and also because of a tendency in some quarters to ridicule the same, the excellence of the work done by the high-grade schools was pointed out, particular reference being made to the high character of the text books, prepared by recognized authorities on the subjects. The weak points, the drawbacks, existing in the best of such courses were likewise pointed out in detail, simply as a matter of information, it being understood that most of these are unavoidable in the nature of things. In all that was said in this article we heartily concur. The opportunity afforded by these schools to the ambitious among the masses who, as a rule, cannot afford a technical course in a college is valuable and far reaching

in its influence, and no one appreciates this more thoroughly or admits it more readily than the college-bred engineer. Nevertheless, there is one practice of some of these schools—not all—which we have heard condemned by members of the engineering professions, and with justice, it must be admitted. In many of the advertisements of these courses, by making it appear that the engineering professions are easily and quickly learned and by listing them indiscriminately with the variety of trades or occupations now covered by the larger of these schools, the impression which is conveyed regarding these professions is undeniably one of inferiority. For example, we have before us one such advertisement in which the interested person is asked to indicate in the heterogeneous list given, running from show card writer to civil engineer, which "occupation" he prefers, promising to show him that it is "not only possible but actually easy" for him to enter that occupation. It is not surprising that the members of the high and difficult calling of the civil engineer, for instance, should consider that such a presentment is a reflection on the dignity and superiority of their profession, lowering its standard in the eyes of the public. It is also misleading to the student, actual and prospective. In view of the great and valuable work these schools are doing we feel that they owe it to themselves as well as to these splendid professions in which they give instructions to modify a practice which tends to cast discredit thereon.

A PHASE OF RAILROAD BONDING.

During the last year we have had occasion more than once to point out the "bond period" into which, as regards their broader operations in finance, the railroad corporations of the country have entered. Its most impressive index is the increase of the bonded debt of American railroads from $32,494 a mile to $35,418 a mile (about nine per cent.) during the year 1904, while, during the same year, capital stock per mile decreased from $30,719 per mile to $30,686 per mile; and when the returns for 1905 are fully made up we have little doubt that a similar, if not larger, bond increase will be shown in view of the size of bonding issues during the last few months. Historically, bond periods in our railroad development have been generally periods of railroad prosperity and good health, and such is the case now. Some of the fiscal phenomena of the present great standing harvest of railroad bonds are, however, unique and striking, and especially so is a new relation of investors to such bonds as a sequel of the rapid progress of railroad consolidation. While it is a fact which cannot be measured in exact figures, it is one which railroad financiers have begun to encounter, especially in those regions and centers where single great railroad systems have their special spheres of fiscal influence and look for markets for their securities.

Forty years ago the independent railroad corporations of the country were many. Now they are relatively few. Each independent company, whether large or small, had its stock—sometimes of two or three classes—and its mortgage debt represented by from one to several groups of outstanding bonds. The mortgage security was specific and localized. It covered a railroad property usually simple in character, not interstate, often small in size, easily visible, and its annual report readily analyzed with gross earnings, seldom going beyond six figures in dollars and not infrequently falling to five. The great mergers and consolidations have changed all that, and with the absorption have, of course, gone many of the separate and small bond issues with their specific local mortgage security. The one-time bondholder of the small road now finds himself the owner of bonds—often by the process of exchange—of a different bond of a bigger road. What is more to the point, he often finds also that, by the same process, from being an investing bondholder in several comparatively localized lines—with a moderate investment in each—he is become a large holder of the securities of the great absorbent corporation, and that not by original volition but by the compulsion of railroad events. The same truism holds if his local railroad stocks have been guaranteed by the big company; and if he hunts new railroad investment he must go pretty far afield to a new financial center and rely upon investment opinion secondary, derivative and often misliked by the ultra-conservative security holder.

There has thus been reached in many cases a situation following the great railroad mergers in which the investor finds himself overloaded with the securities of the dominating railroad system. He has—or, what amounts to almost the same thing, thinks he has—in the rural phrase, "too many eggs in one basket"; and this condition affects considerable areas of the country with large investment capital, and bears also on considerable groups of conservative investors. The situation presents one anomaly. Large issues of bonds of the big system have supplanted the smaller mortgages of the subsidiary and annexed lines. But these larger issues, averaged for their security, undoubtedly rank higher than the average of the smaller mortgages which they have superseded. They cover larger properties, they identify themselves with a great system, and are usually protected by valuable equities in junior interests, including the railroad's share capital. There have been, in fact, during the last twelvemonth very few issues of new bonds of great railroad corporations which have not been of a high grade, and offered at a 4 per cent. basis or below. But this does not affect much the sentimental scruple of the bondholder whom railroad consolidation has overloaded with securities bearing the title head of one corporation. If a trustee who must render an account, he hates to be found with, say, half or two-thirds of his trust held in one corporation. Savings banks considerably, trust companies somewhat less, are under stress of the same argument, and even the man who invests his own funds generally prefers the distributive to a centralized policy.

The case has now begun to expand beyond the steam railroad system. Thus the holder of a trolley railway bond in the Hudson river or Mohawk valley or in Connecticut or Massachusetts a year or two ago deemed himself the owner of a street railway bond pure and simple. He now finds himself, while still the holder of the same bond, a dependent of the New York Central or New Haven corporations, which have bought up the trolley systems. The security is not decreased in value by the change—on the contrary, it is apt to be decidedly enhanced. But if the trolley bondholder, before the trolley sale, was already a large holder of the steam company's securities, the sentimental disposition to unload a part, at least, of his holdings becomes a force in his investment policy.

At a period when centralization is the resonant keynote of railroad policy, every new phase of it is of interest and significance. Among its fiscal phenomena this overloading of the investor is not a fact to be despised simply because it thus far seems to have gone almost unnoticed. Indeed, unless we are greatly mistaken, it is already beginning to be felt in that law of supply and demand which affects even the best types of new railroad bonds—in this case tending to increase the supply and considerably lower prices in the market. To illustrate the situation we could name here at least one great railroad corporation that prolongs the corporate existence of strong subsidiary lines as a basis for separate mortgage security and higher prices for new bond issues. In seeking a measure of the size of this "overloading" and its psychological influence on investment, three or four points in the market quotations of certain large groups of bonds is probably fair and, by some, may be considered excessive. But, as the tidal flood of railroad bonds—competing with, for example, new industrial and telephone securities—rises, and, along with it, railroad mergers proceed, the results of the overload of the investor is a thing to be watched with interest. That, for instance, it is one of the obscure but genuine forces in the expanding device of the convertible railroad bond can hardly be disputed.

ELECTRIC SYSTEMS FOR HEAVY RAILROAD SERVICE.

Among railroad officers there are many to whom electrification is a live question, but there are few railroads whose staff includes an engineer who has followed the subject so closely as to even understand the nomenclature of the new science and discuss it intelligently with the electrical companies' engineers. Fewer still have any confidence in their own judgment of the comparative safety, reliability, original cost and cost of operation of a.c. and d.c. current systems. This is not censurable. For these it is not written in the Good Book: "Even a fool, when he holdeth his peace, is counted wise." The knowledge is not necessary until its time comes, and meanwhile the different systems are being tried out by discussion, experiments and actual use in comparatively light service; and we shall not need to wait long for the results of working of the alternating-current locomotives and motors on the New Haven road under like conditions and side by side with the direct-current locomotives and motors of the New York Central.

Nevertheless, there is a present value to every operating officer in reading the discussions before the New York Railroad Club, of which the substance is reprinted in last week's and in the present issue of this paper. Much of this is technical, some of it is historical, but there is a remainder of clear statement of the economics

of the proposition. Even where the change is compulsory, as it is with the Central and New Haven terminals in New York City, there is a chance to make it profitable. Mr. Wilgus says:

"To secure increased earning capacity in making a change from steam to electricity a change must also be made in the operating conditions that by long experience are known to bring about the creation of a new remunerative traffic. We all know that when the change from horse cars to electric cars was first proposed many arguments pro and con were made as to the relative cost of operation and therefore the effect upon earnings. Almost, immediately, however, the question of comparative cost of operation disappeared because it was discovered that the improved conditions, entirely apart from the cost of operation, created enormous increase of traffic that made the advantages from the use of electricity self-evident."

There is no reason to expect any such proportional increase of receipts, in a change from steam to electricity, as was obtained by the change from horse power to trolley, except by suburban and some local trains. It has been difficult for most of us to see an advantage in electrically-operated express trains or freight trains, but Mr. Townley indicates some possibilities, in that the electric locomotive has available unlimited power, while the steam locomotive is limited to the power generated in its own boiler. This means that the size and weight of freight trains, or the speed of express trains, will not be limited by the present strength of track and bridges, or by weight on driving axles. Enough electric locomotives can be coupled up and worked by the multiple unit system to move anything at any speed, if the draft gear is strong enough. This feature, combined with the economic divisibility—more frequent small trains at an approximately proportional cost per car mile—makes a basis for considering the revolutionary proposition to abandon the well-developed and nearly-perfected steam locomotive.

Mr. Townley, alone among those who took part in the discussion, said: "The track capacity of any given road can be materially increased by the substitution of electric traction for steam." This is important if it can be shown to be true. We have in mind one railroad, with a congested line, and the problem before it of additional tracks, or additional "track capacity," to be secured by electrification. After careful study, the engineer of one of our great electric companies was not able to demonstrate any material increase. This was during the past year, and the chance is still open.

In one respect the New Haven road gives the best possible opportunity for demonstrating the advantages of electrification for the public benefit, for an increase in revenue and for possible economy. It is an interlaced, complicated system, largely for local services; an inevitable combination due to the force of circumstances, rather than a consolidation of the modern type. It owns 240 miles of electric trolley lines, and its problem is to make these trolleys, working in harmony with its own lines, earn more money and give better public service. Here, if anywhere in the world, electrification of the main lines and branches, at any cost within reason, should be profitable, as it enables the company's trolley cars in city streets to pick up passengers and run through to destination; and there appears no reason why this extension of service is not alike applicable to freight. For the carrying out of this scheme the alternating-current locomotives and motors with overhead conductors seem best adapted to involve the least possible complication.

It is out of place here to discuss the estimated comparative costs of installation and operation of the a.c. and d.c. systems. It is a matter of fact rather than of opinion, and the electric companies will soon develop the facts. Mr. Wilgus, with an evident desire to be fair-minded in his dignified contribution to the discussion, seems to be in conflict with himself in prophesying the comparative safety of the two systems. He admits the dangers of the use of the third-rail conductor, proved by many ghastly catastrophies; assumes that his protected, under-contact, rail conductor is safe, although it has never been tried, even experimentally, in actual service; and, nevertheless, in his summary makes it axiomatic that companies "must employ well-tried apparatus that has passed beyond the experimental stage." His protected conductor rail is promising, but we have no evidence that a derailed train may not plow it up or tip it over, with a result of holocausts the like of which have already occurred. His fear of derailed trains knocking down the supporting members of overhead construction used in single-phase operation is more reasonable—in theory. It is something like the danger of knocking down the trusses of through bridges; but the record of such accidents is small, indeed, in modern times, and if this objection holds against overhead construction for electric power, it is logical that through bridges should be eliminated. But we need not theorize about this, for the record of safe use at high speed of overhead conductors is long and satisfactory.

In this paper for May 12, 1905, page 475, there was published a selected list of then existing trolley runs at high speed longer than 20 miles. This showed 14 trolley services, 50 to 188 mile runs at average speeds of from 20 to 30 miles per hour. These average speeds necessitate occasional running at 60 miles per hour. The operation is safe. Admitting that local conditions will often govern, the fact that the two great electric companies have contracts for over 500 miles of single-phase alternating-current electrification is by so much indicative.

February Accidents.

The condensed record of the principal train accidents which occurred in the United States in the month of February, printed in another column, contains accounts of 26 collisions, 17 derailments and two other accidents. Those which were most serious, or which are of special interest by reason of their causes or attending circumstances, occurred as follows:

Feb.		Killed.	Injured.
3d	Duran, N. Mex.	0	15
5th	Helena, Mont.	4	1
14th	Janesville, Wis.	3	10
14th	Columbus, Kan.	3	2
15th	Boston, Bass.	1	8
18th	Swannanoa, N. C.	2	3
25th	Enterprise, Miss.	1	12

The most prominent accident in this list, the collision due to a runaway near Helena, Mont., apparently escaped being a great holocaust only by the fact that the passenger train carried but few passengers. The only explanation of the cause is that near Austin the engine of the freight train was detached from the cars to take water and "by some means the cars got started down the hill." It was in August, 1901, that 34 passengers were killed in the same state (at Nyack) by a collision due to a similar runaway. Are steep grades specially dangerous in Montana? Or was the lesson of 1901 poorly learned?

The collision at Boston on the 15th resembles the Montana case in that a chief element in it was a feature which is known to be dangerous and which has been exemplified in other collisions quite recently. The car in which the passenger was killed was a light car placed in a train between heavy cars. The case was exactly like that at Sheffield, Mo., in October last, when 13 persons were killed. It raises the query whether the lessons of collisions, as related to the make-up of passenger trains, will have to be separately exemplified on each railroad before the danger of mixing heavy and light cars in the same train shall be duly appreciated.

The number of electric car accidents reported in the newspapers of the United States in the month of February was eight, in which eight persons were killed and 63 were injured.

Massachusetts is very far ahead of any other American state in the intelligence and energy with which she has tackled the grade crossing problem, but even in Massachusetts some of the most pressing local problems have been found very hard to deal with and are still unsettled; and there is a persistent demand that things be made to move faster. A bill has been introduced in the legislature to empower each special commission—one of which is appointed to deal with each local problem—to decide how soon its orders shall be carried out. Reciting that human lives continue to be sacrificed and that more speedy action is a necessity, the proposed bill aims to take the matter out of the hands of the railroad commission. It seems likely, however, that nothing can be done, for the causes of delay are by no means trifling. In some cities, the interests of conflicting parties and the great cost have made action seemingly impossible for the time being. The city of Boston is particularly opposed to a change in the law just at present, because of the great expense that might be thrown on the city for work in the Charlestown district which must be done in the near future. Again, a special commission never knows, until it takes up a case, what obstacles are going to be encountered. For interminable and unavoidable "delays of the law" the grade crossing problems of the great cities afford examples scarcely less striking than those afforded by the interstate freight-rate problem. The progressive citizens of Massachusetts are, indeed, to be commiserated. But those of them who are inclined to despair should look for a moment at their neighboring state of New York. If Massachusetts is slow, New York is, in comparison, dead.

A second rear collision has occurred on an English road which uses automatic block signals, and like the first, it was on an electric line. Can it be that our British cousins, in adopting these two American "features"—automatic signals and electric propulsion—have also adopted a third characteristic American product, and have thus given themselves a larger collision record? This accident occurred at North Ealing, on the Metropolitan District; the runner of a work-car, without leave, deliberately ran past a stop signal, so as to try the automatic stop, but the stop did not prevent the collision, and the questions on this point engage most of the inspector's attention. The stop acted, but the speed was not suffi-

ciently checked. There was an overlap of 424 ft., and the grade was such that the car should have been stopped in 300 ft., but it struck the car ahead with much force, and seven persons were injured. The inspector concludes that the motorman under-estimated his speed and that the work-car, having two pairs of motor armatures, instead of the one pair usually found on passenger cars, had more momentum than the motorman had calculated on. The principal moral to be drawn is, therefore, that for such vehicles, with such a short overlap, the present speed limit at automatic signals (30 miles an hour) should be made lower. The inspector also finds that the use of sand has been neglected, for the reason that somebody believes that by it the track circuits would be interfered with. The inspector rejects this argument, as well he may; but he modestly contents himself with the conclusion that "the subject [of sand] is one on which the views of the company should be obtained."

Delaware & Hudson.

In common with the other anthracite carriers, the Delaware & Hudson has had a year of very marked prosperity. Under the present agreement between operators and miners, which expires April 1, anthracite coal, the main source of profit and traffic of the company, has been produced in larger quantity than ever before. General prosperity has at the same time helped to enlarge passenger and merchandise freight traffic. It was, of course, to be expected that in the year following the strike, earnings would attain record figures, but it could not have been expected that the high records of 1903 would be surpassed in each of the two succeeding years. The earnings of the Delaware & Hudson Company come from two sources—the mining and sale of coal and the operation of its line of railroad extending from Wilkesbarre, Pa., northeast through Albany and Saratoga, N. Y., to a Montreal connection at Rouse's Point, on the international boundary.

In 1902, the strike year, gross earnings from all departments were $22,500,000, a decrease of $7,000,000 from the previous year. Railroad earnings were $11,000,000, a falling off of over $1,000,000 from 1901. The year after the strike (1903) saw railroad earnings rise to $13,600,000, a gain of over $2,500,000, and gross earnings to $34,000,000, an increase of $11,500,000. The next year's earnings not only kept pace with these enormous increases, but in 1904 railroad earnings were $15,000,000, an increase of nearly $1,500,000, and gross earnings were $34,600,000, an increase of nearly $500,000. Following this nominally slight but, in reality, striking increase in gross earnings over the increase of $11,500,000 following the year of the strike, gross earnings have taken another upward move of more than $2,600,000. At the same time, railroad earnings increased last year $1,300,000 over the 1904 figure. This surely is a record of progressive corporate well being.

Of the $37,331,629 gross earnings from all departments, 73 per cent. came from coal. Of this amount $20,000,000 came direct from the sales department, and $6,889,764 of the $16,382,074 total gross railroad earnings from the transportation of coal. Total net earnings were $7,695,923, less interest and rentals of $3,016,328, leaving $4,679,594 as the total net income for the year after all charges, being 11.14 per cent. on the $42,000,000 capital stock. Dividends of $2,869,300 were paid; $1,303,643 was charged to profit and loss and credited, $800,000 to mining plant and $503,643 to equipment, and the net income balance of $188,908 was credited to profit and loss.

The road is operated in four divisions—the Pennsylvania, Susquehanna, Saratoga and Champlain divisions, following in this order from the Wyoming valley north to the Canada line. On the two southern divisions carriage of coal is much the most important business. Pennsylvania division earnings from coal were $3,326,968, which is 74 per cent. of the division's total freight revenue of $4,521,609. On the Susquehanna division, coal earnings were $2,794,761, 52 per cent. of the total freight revenue of $5,344,375. Coal traffic on the two northern divisions is a much smaller share of the total, being in each case 23 per cent. of total freight earnings of $2,125,701 on the Saratoga, and $1,242,269 on the Champlain division. On both of these northern divisions, passenger earnings were considerably larger than earnings from coal, amounting to more than one-third of total earnings; whereas on the two southern divisions passenger earnings were only about one-tenth of the total.

Gross passenger earnings were $3,014,839, of which the Pennsylvania, Susquehanna and Champlain divisions, aggregating 594 miles, earned $1,828,809, against $1,186,030 on the 249 miles of the Saratoga division. The importance of the passenger traffic on this division and the necessity for protecting it are shown by the acquisition during the year of a half interest in the Schenectady Railway (electric), and also, though not mentioned in the report, of a half interest in the United Traction Company, which controls the street railway systems within the cities of Albany and Troy.

The main line mileage was 843 miles, the same as in 1904. This makes it easy to compare operations for the two years. Maintenance of way figures out at $1,731 per mile of main track, against $2,101 in 1904 and $1,922 in 1903. A decrease in a year of $370 a mile, or 18 per cent. in cost of maintenance of way would, in the case of many roads, mean skimping the property; but the Delaware & Hudson's expenditures on the line are so liberal that this merely brings the figure down more nearly to the general average. Large expenditures on the line in preceding years must have been largely responsible for the reduction.

Under maintenance of equipment, repairs of locomotives cost $1,886 per locomotive, against $1,744 in 1904 and $1,186 in 1903. Repairs of passenger cars cost $377 per car, against $381 in 1904 and $321 in 1903, and repairs of freight cars cost $58 per car, against $43 in 1904 and $41 in 1903. Twenty-two locomotives, six baggage cars, four combination cars, 131 coal cars, 12 milk cars and 15 service cars were purchased or built during the year.

Conducting transportation cost $7,230 per mile, against $6,145 per mile in 1904 and $5,560 in 1903—an increase for 1905 over 1904 of $1,085 per mile, due to the largely increased traffic handled by the road. Gross earnings of the railroad department were $19,433 per mile in 1905, against $17,878 in 1904 and $16,617 in 1903, an increase of $2,816 per mile in two years. Expenses were $12,081 per mile, against $10,908 in 1904. Net earnings were $7,352 per mile in 1905 and $6,970 in 1904, an increase of $382 per mile following an increase of $303 per mile in 1904. These are notable earnings' increases.

Traffic and mileage statistics show 6,965,154 more passengers carried one mile than in 1904, and 325,059,477 more tons of freight carried one mile than in that year. The passenger miles were 120,840,369, or 143,364 passengers one mile per mile of road; and the ton miles 2,107,422,372, or 2,500,234 tons one mile per mile of road. This is an increase of 385,649 tons in freight density. The rate received per unit of both passenger and freight traffic was slightly lower than in 1904. Total freight earnings increased from $14,346 per mile of road in 1904 to $15,700 in 1905. The train load showed an increase for the year of 35 tons. It was 393 tons in 1903, 420 tons in 1904, and in 1905, 455 tons. Anthracite coal furnished more than one-half of the total freight tonnage of 18,021,300 tons, and nearly half of the increase for the year of 2,409,137 tons. The tonnage of bituminous coal increased 20 per cent., and of coke over 200 per cent., probably partly as a result of closer interchange relations with the Pennsylvania Railroad (Sunbury division) at Wilkesbarre.

Financial operations of the year consisted in refunding $10,000,000 first mortgage bonds of the Albany & Susquehanna Railroad, a subsidiary company. The Albany & Susquehanna has issued new bonds at a lower rate of interest, which were offered to stockholders of the Delaware & Hudson to the amount of 25 per cent. of their stock. These bonds have, for 10 years subsequent to their issue, the privilege of conversion into stock of the Delaware & Hudson at the rate of five shares of stock for each $1,000 bond. An increase of $5,000,000 in Delaware & Hudson stock has consequently been authorized.

One important element of the Delaware & Hudson's strength lies in its large appropriations out of income for betterments and depreciation. During the past year $1,821,573 was appropriated from current earnings and profit and loss for betterments, and $2,347,126, written off various accounts for depreciation, a total appropriation of $4,168,699. Depreciation charges included $826,000 charged off railroad equipment, and $800,000 charged off mining plant, washeries, etc., which cancels this item as an asset on the balance sheet. This is an extreme case of conservatism in valuing tangible property, an extensive mining plant being now carried on the books at no valuation whatever. The sinking fund, amounting to five cents a ton on coal produced, was $250,260. In accordance with its provisions, 500 shares of the company's stock were bought for $92,513 and retired, and on April 1st, 2,285 shares of stock, to be obtained by exchanging $457,000 in Albany & Susquehanna new bonds, not taken up by stockholders but purchased for the sinking fund, will be similarly canceled.

The principal figures for the year's operation follow:

	1905.	1904.
Mileage worked	843	843
Freight earnings	$13,233,954	$12,092,269
Passenger earnings	3,014,839	2,842,962
Gross railroad earnings	16,382,074	15,071,124
Maint. of way and struc.	1,459,345	1,724,931
Maint. of equipment	1,884,725	1,574,874
Conducting transportation	6,094,763	5,180,335
Railroad operating expenses	10,183,960	9,195,281
Gross earnings from all depts.	37,331,629	34,655,113
Net earnings from all depts.	7,695,923	7,452,479

Michigan Central.

The report for the year ending Dec. 31, 1905, reflects the prosperous conditions of the rest of the Vanderbilt system. The mileage was increased from 1,653 to 1,745 during the year, principally by assuming operation of the Detroit, Toledo & Milwaukee Railroad from Homer to Allegan, 66 miles. Gross earnings increased $1,790,924 to a total of $23,283,868, and although operating expenses, chiefly owing to liberal charges for maintenance of equipment, increased even faster than earnings, a good gain was shown in gross income after the deduction of expenses due to the

increase of $252,341 in the item "other income," arising principally from increased revenue from securities held and interest on advances. After paying dividends, which aggregated 8 per cent. during the year and which consumed $749,520, a surplus for the year of $223,934 was carried forward, as against $123,255 in 1904. The Michigan Central carries a good deal less coal in proportion to other commodities than is the case on most of the railroads of the country, and it carried a little less this year than it did last. Anthracite and bituminous together amounted to only 26 per cent. of the total tonnage. The freight traffic of the road is unusually well diversified, with a large movement of grain, of forest products and of general manufactures. As a result, the road gets a good ton mile rate, averaging .615 cent; and at the same time manages to get an average revenue train load of 418 tons. This has been very greatly increased during the past year. In 1904 the average revenue load was 371 tons.

It is interesting to see that earnings from passenger and express traffic have been increasing even more rapidly in proportion than have earnings from freight traffic. The proportion of increase in freight traffic during the year amounted to 6 per cent., while passenger and express traffic together increased over 12 per cent. This is quite an extraordinary showing in a year which indicates no special reasons for such a growth. The increases were due to both local and interline business and indicate a very healthy state of affairs in the company's prospects. The following table gives the principal statistics of the year's operation:

	1905.	1904.
Mileage worked	1,745	1,653
Freight earnings	$16,255,481	$15,273,012
Passenger earnings	5,225,528	4,818,764
Gross earnings	23,283,868	21,492,945
Maint. of way and struc.	3,418,740	3,135,125
Maint. of equipment	4,386,927	3,261,044
Conducting transportation.	10,518,814	10,130,382
General expenses	541,435	514,464
Operating expenses	18,865,916	17,041,015
Net earnings	4,417,952	4,451,930
Gross income	4,733,764	4,515,401
Net income	973,454	872,775
Surplus after dividend	223,934	123,255

Wheeling & Lake Erie.

The report at hand for the year ending June 30, 1905, is the sixth which the company has made, and the first full-year statement to be signed by President F. A. Delano. It will be recalled that the Wheeling & Lake Erie is now controlled by the Wabash-Pittsburg Terminal Company through ownership of 51.73 per cent. of its capital stock, while the Wabash-Pittsburg Terminal Company also controls the Pittsburg Terminal Railway & Coal Company through ownership of its entire capital stock, and is itself controlled by the Wabash Railroad through a similar entire stock ownership. The Wheeling & Lake Erie and the Wabash-Pittsburg Terminal Railway together furnish the Wabash entrance into Pittsburg and supply it with highly important traffic connections at Cleveland, Wheeling and Toledo. The Gould management has realized the importance of having at least this portion of the system in thoroughly able hands, and it is safe to say that no unit in the Gould group of roads is better worked at the present time than the Wheeling & Lake Erie, with F. A. Delano as President and B. A. Worthington as First Vice-President and General Manager. The brief statement of President Delano, which heads the report, explains that the difficulty heretofore has been that the road was too poor to adequately supply itself with equipment or to make the necessary improvements to take care of the business at hand. Last spring 62 locomotives, contracted for in the summer of 1904, were received, and these have proved of great service. Two thousand cars have also been added to the equipment since the close of the fiscal year under review, and the increased business handled with this equipment has fully justified the expenditure. The Wheeling & Lake Erie has not yet begun to receive any considerable benefit from the Wabash-Pittsburg terminal, and the benefits of the Pittsburg extension will probably not begin to show until the latter part of the fiscal year; but it is fully expected that by the summer of 1906 there will be a very material increase in the business derived from this source.

The road started off under its new management handicapped by a number of unfavorable circumstances, beside the shortage in equipment and in general facilities. For example, the cost of operating was materially increased by the necessity of putting on a number of fast non-paying passenger trains for World's Fair business. The company also encountered a severe drought which lasted from October to February, which still further reduced the usefulness of the road's equipment, already insufficient to take care of the business. The average earnings per mile of road for the entire fiscal year amounted to $10,393. For the six months ended Dec. 31, 1905, the average earnings were at the rate of $13,118 per mile, and the company believes that it could easily have increased the earnings 50 per cent. if it had then had the track facilities and the equipment necessary to handle the business. Mr. Worthington says in his report that the future of the property is dependent wholly upon this development of facilities, and he believes that the business that can be obtained along its lines should enable it greatly to multiply its earnings per mile of road.

In the income account, earnings from coal carried are separated from the general total of gross earnings and are shown to constitute 36 per cent. of the total. Except for this separation, however, the report does not show a classification of the freight carried, and such a classification would be interesting. Besides the coal traffic, iron and steel of course constitute an important part of the tonnage, though just how important cannot be stated. It will be recollected that the Carnegie Company has contracted to give the Gould roads 25 per cent. of its Pittsburg tonnage, though this arrangement is now pending the completion of the West Side Belt Railroad to the works; a link which is expected to be in operation by summer.

The company is capitalized at the rate of $83,666 per mile, stock, and $33,079 per mile, bonds, exclusive of equipment trust obligations. This makes a pretty good load to carry, as with all the Gould properties, but the funded debt, at least, is low. Net earnings for the current year fell almost $2,000,000 short of meeting interest, taxes, rentals and discount, but it seems reasonable to suppose that the new Pittsburg traffic, new equipment and facilities and good management will be able to put quite a different aspect on the statement next year. The following table shows the principal operating statistics for the year ending June 30, 1905.

	1905.	1904.
Mileage worked	442	442
Freight earnings	$3,812,461	$3,535,879
Passenger earnings	534,410	493,748
Gross earnings	4,595,607	4,325,282
Maint. of way and struc..	732,228	687,119
Maint. of equipment	763,899	717,459
Conducting transportation	2,015,119	1,750,710
General expenses	127,889	120,011
Operating expenses	3,639,135	3,275,299
Net earnings	956,471	1,049,983
Surplus	193,360 (deficit)	63,654

TRADE CATALOGUES.

"In the Maine Woods," an annual publication of the Bangor & Aroostook Railroad, is in size, interest, quality of engraving and descriptive writing, easily the peer of the first-class magazines. Editorially, it has but one objective: To make known the charms of out of door life in northern Maine. This it does in 130 pages, with a series of descriptive articles and 118 engravings of incidents and ways of living in the woods. These show how easy it has been made to live with absolute physical comfort, surrounded by chances to fish, hunt, photograph and study nature. This magazine is a fine example of method in creating new railroad business, but it is only one of the several activities of this company in pioneering. On its northern lines, primarily supported by lumber industries, it has won population and an enduring source of revenue by making known its agricultural and manufacturing possibilities. It is a marked instance of successful pioneering by a transportation company.

Dump Cars.—Two new types of Goodwin steel dump cars are shown in the 1906 catalogue of the Goodwin Car Co., New York. These two types are designated Class P P C for coal, ore, limestone and other bulk freight and Class S P O for ore. The essential features of the Goodwin general service dump car Class G have been retained, but these two types are much simplified in every detail. The weight has been reduced without sacrificing strength and the capacity has been increased to 120,000 lbs. of bituminous coal for the Class P P C cars and 120,000 lbs. of ore for the Class S P O cars.

Locomotives.—The Baldwin Locomotive Works, Philadelphia, Pa., has just issued its "Record of Recent Construction," No. 54. It contains half-tone illustrations and specifications for upwards of 15 locomotives built by the company for foreign roads, including locomotives for use in Porto Rico, Brazil, Japan, Chile, etc.

CONTRIBUTIONS

Cab Arrangements on Electric Trains.

Newark, N. J., March 22, 1906.

TO THE EDITOR OF THE RAILROAD GAZETTE:

As an engineman on one of the railroads which in the near future will in part be equipped with electricity, I should like to ask why there is so little attention paid to the cab arrangement of the new cars for this service. The side door arrangement in use on the Long Island Railroad and also to be used on the new cars for the New York Central, by which the side door of the vestibule is fastened in position half way, is not a very good arrangement from the motorman's standpoint, as it tends to chill the vestibule in cold weather, and in case the motorman wishes to look back

at his train it is very unhandy as a window. The cab of a car for this service should be built with a drop sash in the side door, if no regular side window can be had, and the controlling apparatus so placed that the motorman can use the window without leaving his seat, very much the same as the cab seat and window of the steam locomotive. A look at one of the cars of either the Manhattan elevated or Brooklyn elevated roads will show how much in favor the side window and seat is with the motorman. W. P. N.

Shavings Cut from the Rail.

New York, March 20, 1906.

To the Editor of the Railroad Gazette:

I note your editorial comment on my communication in *The Railroad Gazette* of March 16, relating to the shearing of shavings from the outer rail on very sharp curves under certain conditions.

Referring to my expressed opinion that the coning of the wheels is the principal cause of this shearing, you say: "Perhaps there is an error in this," and proceed to show that the present standard coning is so small that it could have very little appreciable effect.

The action of the wheels of a car truck upon curved track has been observed more or less, and has been theorized about a great deal. It is not a simple problem to investigate theoretically, and scarcely any two writers seem to agree in conclusions. My own study led me to the conclusion I have roughly stated in the communication, but to undertake to demonstrate it would take up too much of your space, and would bore most of your readers—if they undertook to read it at all. Small as is the coning of standard wheels, it seems to be sufficient to produce the results observed.

It will be found, I think, that whittling of the rails occurs only with new wheels where the coning is not yet worn away. In the cases I have observed it occurs mostly where the gauge on curves has been originally, or has been widened, so that the front outer wheel may impinge at a considerable angle against the rail. Whatever may be the pressure, the flange of the wheel and the edge of the rail must stand at a certain angle with each other before actual shearing of the softer metal will take place, just as in a planer the edge of the tool must make a certain angle with the surface to be planed before it will take hold of the metal. The coning of the wheels not only tends to produce the necessary pressure, but to increase the normal angle between wheel and rail.

However, the principal object of my communication was to suggest a remedy for this shearing action, and I hope that some of your other readers who may have had experience in similar cases will favor us with their observations. S. Whinery.

President Mellen on the Hepburn Bill.

The following extracts are taken from an address recently delivered at Hartford, Conn., by Charles S. Mellen:

Any legislation along lines that will accomplish the practical elimination of preferences and discriminations (and the present laws have nearly acomplished their purpose in these respects); amendments to existing laws requiring the frequent examination of books, records and accounts, as in the case of national banks, with the fullest returns and their publication and accessibility—will do more good to the public (and be without harm to the carriers) than any such legislation as is now pending before the United States Senate.

Under existing laws, amended to include car companies and other carriers not now subject to the Interstate Commerce Act, and with power to examine books and accounts and give such measure of publicity to the operations of the carriers as might be adjudged necessary, I would myself undertake to stamp out and hold in restraint the payment of all rebates and the practice of discrimination as completely and effectually as are murder and other crime against persons and property in all well-organized, well-disposed and law-abiding communities. More than this is impossible, and such a bill as this is unnecessary to eradicate the only evils of railroad management of which complaint has been made, or which are claimed to be existing, and would appear to be an attempt to obtain doubtful legal powers for an ulterior purpose not frankly disclosed.

It is easy to incite, it is exhilarating to lead, it is pleasing to be applauded; but the man is yet to come forward who can satisfy and control the mob, and it is well for the sober, successful citizen to think whether or no he should wait until his own particular interest is attacked before he rises to defend from such attack an interest so large, so important, so far-reaching as the railroad interest of this country, for the precedent established, his own interest will stand next in line waiting for the same disposition to interfere and manage it to his detriment.

To attempt in the short time at my disposal a thorough analysis of the Hepburn bill is impossible; but I will refer to one or two sections that have received but little attention by the press, and which seem to me to be open to most serious objection as being dictated by no public interest, and unnecessary unless there may be some ulterior object, and certainly giving such a grand chance for graft as to render a position upon the Commission one of the finest opportunities in the speculative world.

So much has been said about review by the courts (and the arguments for and against have been without number) that I much fear other important objections may be overlooked, and I will only say upon that particular branch of the subject that you should view with suspicion, and visit with your condemnation, any man or set of men who solicit to render you service but are wary of review by the courts until it is too late to be of any good. Their main interest is less your advantage than to secure power for themselves.

One would naturally suppose a measure drafted to protect the interests of the public against abuses on the part of railroad management would confine its attention to matters in which the public is interested, and why I believe there is some ulterior purpose not frankly disclosed in the present bill is because it is so drafted that it was plainly the intent of its framers to interfere in the relations of the carriers between themselves, in matters wherein the public has no interest.

The bill contains provisions intended to force the carriers to contract among themselves for through lines or routes, to compel artificial persons created by the states to do that which their charter requirements do not contemplate; to amend their charters, in fact, putting additional burdens upon them without their consent, and all this by a power that had no part in their original being or creation.

The carriers are compelled by their charters to carry persons and property at reasonable rates, and they have spent their money to put themselves in position thus to do; but they are under no obligations beyond their own lines, and I do not believe there is any warrant in equity or justice in attempting to make them assume a liability beyond their charter limits, and if they do their service within the limits of the territory they are chartered to serve there should be no power (outside the power to alter, amend or repeal, possessed by their original creator) to compel them to go beyond those limits to perform another service elsewhere without their consent.

Under Section 15 the power attempted to be conferred upon the Commission is such that our company, having a line partly by rail and partly by water over steamboat lines wholly owned and controlled by it, it is possible, if another party should establish a nondescript steamboat line in competition, for the Interstate Commerce Commission to order us to establish a through route with that line, and prescribe the rates and the divisions of those rates that shall obtain, thus diverting from our own line our own business, dividing our revenue, reducing values and consequently impairing the service—and for no advantage whatsoever to the public (unless it be to force a compromise or purchase), for such temporary reductions of rates as are the result of such a policy are more often a curse than a benefit, in that they are unstable, and a cause for discontent when all either do not or cannot participate. A policy like this is simply a case of robbing one carrier to benefit another, and offers the widest possible chance for speculation in reducing the value of the securities of one carrier and enhancing the value of those of another, with no possible advantage accruing to the public; and unprincipled men will be quick enough to see and take advantage of the same—and such, you know, are occasionally found in the service of the Government. The railroads have no monopoly of them.

Under Section 20, power is given to prescribe the accounts, records or memoranda to be kept by the carriers. This is right and proper; the carriers should keep all accounts, records or memoranda prescribed by the Commission, and the Commission should have the fullest power to use the same in any way in which the public interest may be promoted; but in this same section it is provided that any carrier who keeps any other books, accounts or memoranda than prescribed by the Commission is guilty of a misdemeanor and subject to fine or imprisonment, or both, in the discretion of the court. Of what possible advantage is it to the public that a carrier should be prohibited from keeping such accounts, records and memoranda of its business as may appeal to its officers as an advantage in keeping a check upon and record of its operation, so long as all records are kept that the Commission may desire?

Why should I be subject to fine or imprisonment, or both, if the Commission does not prescribe data and memoranda that I need to keep a check upon my business, and I supplement the records it does require by such additional records as I may need for my own convenience and information? Such a law as this would cover with shame the Czar of Russia or the Sultan of Turkey, and is wholly out of place under any enlightened system of popular government.

The warrant, I am told, for all this is that the Commissioners, at times, have been confounded by information supplied by the

carriers in controverting the misleading conclusions they have drawn from accounts kept in their own offices, and they do not propose to have a carrier appear before them with any data or information other than that in their possession, from which conclusions may be drawn contrary to their own; in other words, that no man shall plead in his own case any information drawn from accounts, records or memoranda other than those on file in the office of the Commissioners, for fear that their own misleading results may in the future, as in the past, be proved to their confusion.

To have accomplished the result aimed at, it would have been better to have prescribed (for it would have been much more effectual, although as hard to have controlled) that in any controversy no carrier should appear before the Commission with any accounts, records or memoranda, or with any more brains than possessed by the Commissioners who hear the case.

Washington Correspondence.

WASHINGTON, March 27.—Senator Tillman, in charge of the Hepburn railroad rate bill in the Senate, has made his first move in the direction of pressing for an agreement upon a time for the final vote on the bill, and Senator Dolliver has expressed the opinion that the bill may be passed in 10 days or two weeks, but the end of the debate is not in sight, and it is certain that it will be much more than two weeks before a vote can be had. There is no disposition on the part of any Senators to prolong the discussion unduly or to delay final action, but there are so many points upon which there are radical differences of opinion among Senators that an extension of the debate for some weeks may be necessary to give time for all of the arguments that will be submitted. It is expected that nearly every member of the Senate will make at least one set speech. Senator Lodge has already made two, and men like Senator Foraker and Senator Bailey may be counted upon to make several before the final vote is reached.

While other subjects are receiving more or less attention in the debate, it is apparent that the point around which all of the discussion centers, and over which the principal contest is to take place, is the question whether or not a reviewing court is to be permitted to suspend an order of the Interstate Commerce Commission pending judicial review. There is no longer any practical doubt as to the adoption of an amendment providing expressly for review, but there is much doubt as to whether the amendment shall prohibit the suspension of an order as is proposed by Senator Bailey. Senator Spooner's speech, in which he drew a distinction between the authority of Congress to confer jurisdiction on the inferior courts of the United States or to withhold such jurisdiction, and the power of Congress to restrict the general judicial power of a court when once jurisdiction has been given it, has aroused much doubt as to the constitutionality of the Bailey amendment, and has convinced some Senators that its adoption would add another to the many grave doubts that exist as to the constitutionality of the Hepburn bill.

An argument that is now being brought forward is that if this amendment should be adopted and the courts should be prevented from suspending, pending review, the operation of the provision imposing a fine of $5,000 a day for failure to put an order of the Commission into effect, it would make the bill unconstitutional under the provision of the Eighth Amendment to the Constitution of the United States, which provides that "excessive bail shall not be required, nor excessive fines impcsed, nor cruel and unusual punishments inflicted." It is contended that the courts would probably hold this to be unconstitutional on the ground that it proposed to impose an excessive fine, and on the ground that it would be an attempt to deprive the carriers of the right to have an order reviewed on constitutional grounds, by presenting the alternative of having their property confiscated by the operation of the order or taking the risk of having it confiscated by the imposition of the fine.

The advocates of giving to the courts broad powers of review and leaving them free to exercise the right of enjoining the enforcement of an order so as to prevent the possibility of irreparable wrong being done seem to be gaining ground, but they are not yet ready to claim that they have a clear majority of the Senate. A great deal will depend on the success that Mr. Bailey may have in securing votes for his proposition on the Democratic side of the Senate. It is certain that he will not have the unanimous support of his Democratic colleagues, but the Republicans are also divided, and so many of their votes on this proposition are in doubt as to make it unsafe to predict what the outcome will be.

Senator Foraker intends to press his court proposition and ask the Senate to incorporate it in the bill as an alternative method of procedure, leaving the Interstate Commerce Commission free to proceed with the hearing of a case and issue an order or go into court and ask for an injunction against an illegal charge, as it may prefer. He will contend that even the most ardent advocate of giving the Commission power to make rates cannot object to this, and that it would afford a guarantee of effective legislation being left on the statute books if the rate-making proposition should be found to be unconstitutional. J. C. W.

Rebuilding the Housatonic River Bridge of the New York, New Haven & Hartford at Sandy Hook, Conn.

Speed of construction, as illustrated in the methods employed in replacing Bridge No. 105 on the Highland division of the New York, New Haven & Hartford at Sandy Hook, Conn., which was destroyed by fire, was recently discussed by Mr. A. H. Terry, Division Engineer, before the Connecticut Society of Civil Engineers. The progress of the work is shown in the accompanying photographs.

This bridge was originally a deck wooden truss of three spans, total length 500 ft., and 70 ft. from base of rail to low water level. It crossed the Housatonic river running east and west. The fire which destroyed it was caused by a live clinker which dropped from a locomotive and lodged on the northwest corner of the bridge seat just under the junction of the end post and the bottom chord. The fire was discovered at 10.45 a.m. Sunday, November 19th. There was a strong wind blowing from the northwest and the timber was very dry after a long continued drought. All efforts to check the fire were unsuccessful, and at 11.55 a.m., one hour and ten minutes after its discovery, the bridge was totally destroyed and in the river.

Word was immediately sent to New Haven and by 6 o'clock in the afternoon of the same day, under the direction of Mr. Edward Gagel, Chief Engineer of the road, Mr. W. H. Moore, Bridge Engineer, and Mr. W. J. Black, Engineer Maintenance of Way, the main features of a combination pile and frame trestle with openings for ice way had been designed. Meanwhile word had been sent to all bridge supervisors in the Western district (west of New London and Willimantic) to forward at once to Sandy Hook all timbers and piles which they had in stock of the various sizes needed. At the same time work trains were despatched to each end of the bridge to clear away the wreckage. A small water pile driver with float in three sections, the property of the road, was also ordered to Sandy Hook at once.

After arriving on the ground Monday morning, November 20th, it was decided to pile the center and east spans so far as possible, and to build the west span of frame construction. This last was made necessary on the west span by the fact that the bottom of the river in this span was rock ledge. The trestle as designed was to be built in three tiers with four ice ways, one in the east and one in the west span and two in the center span to be one tier in height and to be each spanned by four girders. These girders were to be placed one under each rail and one under each batter post of the intermediate tier.

Monday, Tuesday and Wednesday (November 20th-22nd) were employed in clearing the wreck and unloading plant and material. Thursday, November 23rd, saw the work actually started. The plan employed the first week was as follows: On the east side there were at work a land pile driver, a water driver, and for two or three days a steam wrecking derrick which was used to lower the heavier portions of the plant to the river bank. This does not count two work-trains which were used to bring material, clear away wreckage, etc. On the west side there was a small derrick car and a stationary hoister which was set up on the west abutment. There was also a switch engine to handle the derrick car and bring material to the bridge and a work train for bringing material. After the first week, a patent car pile driver was used for power on the east side and the American Bridge Company's derrick car No. 204 on the west side. This derrick had a 50-ft. boom and capacity of 50 tons, with boom at 30 deg. The force at work after November 24th, consisted of about 100 carpenters and 100 laborers, equally divided between the two sides of the river. This force was in large part brought in daily by trains from Bridgeport, Waterbury, Danbury, and one gang of 35 laborers from East Hartford. Only about 70 men could be boarded in Sandy Hook. These were all bridge carpenters. Most of the work was done between 6 a.m. and 5 p.m. (daylight to dark), although pile driving went on night and day until completed. Such other work as could be done at night was done whenever it was possible to thus expedite the work of the following day.

The trestle, as mentioned above, was built in three tiers. The top pier was a 4-post frame bent with vertical posts 21 ft. long. The intermediate tier was a six-post frame bent with vertical posts 20 ft. long except where bents came on top of girder spans. The bottom tier was a combination of pile bents, frame bents and girder spans. The frame bents were of eight posts each and the pile bents of nine piles each. All bents were spaced 12 ft. centers except in the case of the girder spans and on a skew of 60 deg. The girders had their bearings, in the case of the east and west openings, in a double bent at either end. In the center openings where two girder spans came together, the bearing at the ends was the same as in the east and west spans. The center bearing, however, was a triple pile bent.

The west span was built as follows: First the sill was bedded,

Nov. 21st. At foot of east abutment. Debris on left is rock scaled off abutment by heat of the fire.

Looking west from east abutment. Wreck of old bridge lying in river on the right. This wreckage lay in the line of the bridge and had to be pulled out of the way before the new bridge could be started.

Looking east from the west side of the river.

View from up-stream. West pier still smoking. Wreckage around west pier and between east pier and east abutment.

View of east abutment from the river side.

Nov. 24th. Temporary trestle in the west span fairly started, showing method of erecting in stepped tiers. The horses were framed flat and ended up with block and fall from hoisting engine on top of abutment.

Rebuilding Housatonic River Bridge of the New York, New Haven & Hartford at Sandy Hook, Conn.; November 21st to 24th Inclusive.

Nov. 26th. Temporary trestle two days later. Men working on runway on which girders for iceway were carried into place.

Construction at west pier showing frame bents erected on rip-rap on the west side and pile-driver at work on piles for center span bent. The bottom was rock ledge on the west side of the pier so that piles could not be driven there. Wreckage in foreground at the left.

Dec. 2d. Looking west. Derrick car placing an 8-ton girder in center iceway.

Dec. 4th. East span looking east. First ten tiers of horses are in place; the top tier lying flat, to be ended up by patent pile driver. This tier of fourteen horses was put together and ended up in thirteen hours.

Looking west from east pier. Getting ready to place girders for east iceway of center span.

Dec. 4th. Looking south.

Rebuilding Housatonic River Bridge of the New York, New Haven & Hartford at Sandy Hook, Conn.; November 26th to December 4th Inclusive.

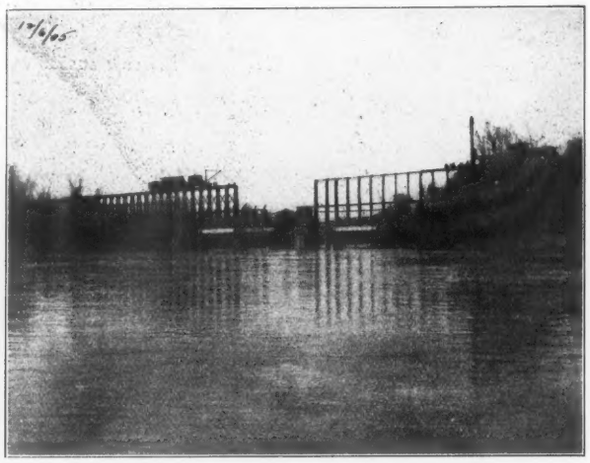
then the posts erected, then the cap placed and the whole ended up by block and fall, power being furnished by the hoister set on the west abutment. When the sills came in the water the bottom was first levelled off with small stone. The higher tiers were put together on the tier next lower and ended up in the same way. To do this it was necessary that each of the two lower tiers should be kept two bents ahead of the one next higher. All timber was cut on the track level and lowered into position by the car derrick until the arrival of the American Bridge Company's derrick. The girders for the west span were unloaded by hand and taken in skids to their resting place, power being applied through block and fall from the hoister. These girders were 55 ft. long and 4 ft. 6 in. deep. The center pair came riveted together and were placed without cutting them apart. After the arrival of the derrick all bents were put together ashore and carried out by the derrick and placed bodily. The iron of the center span was placed by the derrick. The girders of these spans were 55 ft. and 46 ft. long, respectively. The west span and the two higher tiers of the center span, including girders, were built by the force on the west side.

On the east side the construction and method were both different. All except five bents of the bottom course were pile bents. The 46-ft. girders were lowered to the river bank by the steam wrecking derrick and hauled into position by block and fall, the land driver furnishing the power. This gave a level surface to work on. All the bents of the next course were framed together lying flat on the course beneath, before a bent was raised. All the timber on the east side was cut on the river bank just south of the bridge and from there carried to the foot of the abutment, from which point each stick was telegraphed to its destination by a fall running from the patent driver on top of the abutment to the east pier. The bent nearest the pier and farthest from the driver was put together first and hauled into position with its sill resting on its bearing on the rangers of the tier below. The next bent was then framed and hauled into position with its top resting on the first bent and so on. When the entire tier was thus in place, each bent, beginning with the one nearest the abutment, was ended up and stayed in position, after which the rangers were telegraphed into position and doweled down. The top course was placed in the same manner. On this tier, after the timbers had been cut, 14 horses were carried to their destination piecemeal, put together, and erected in 13 hours.

Each bent of the entire structure was braced traversely by a single X brace of 3-in. x 10-in. pine, spiked with ½-in. x 8-in. boat spike. The structure was braced longitudinally by a triple row of rangers between the intermediate and bottom tiers and a double row of rangers between the intermediate and top tiers. In addition to this, there was a single row of X bracing placed longitudinally for the two highest tiers. No dowels were used except for the rangers and track stringers and no mortise joints at all. All joints were made by spiking a plaster of 3-in. plank to cap and post and sill and post. On the west side the track stringers, ties and rails were carried out with the top tier, two methods being employed: Before the arrival of the large derrick car the stringers, ties and rail were carried out by the small derrick car and placed piecemeal; after the big derrick car came, a panel of track 36 ft. long was put together ashore, carried out as a whole and placed bodily. On the east side the top tier was complete before any of the stringers were placed. Here the stringers were all framed on the river bank and hauled into position by the patent driver, after which the track forces placed the ties and rails.

The total amount of square timber was 270,000 ft. (board measure) exclusive of waste, which was small. Of this amount 90,000 ft. was in stock at the time of the fire and the remainder was bought in the market and forwarded to the work as required. There was practically no delay to the work on account of lack of material. The first regular train crossed the new structure Decem-

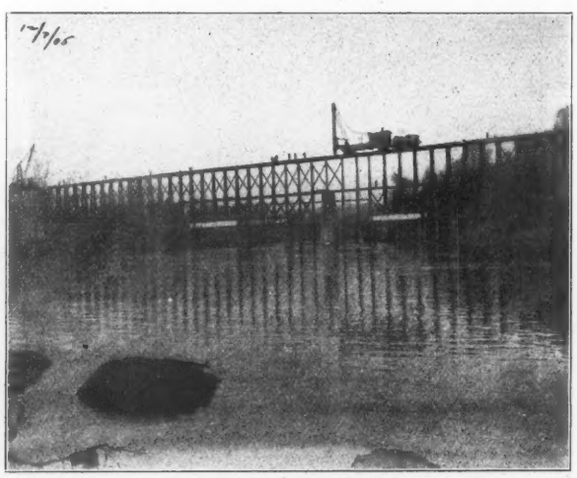
Afternoon of Dec. 4th. Placing last girder in east iceway of center span. Ready to end up top tier of east span.



Morning of Dec. 5th (not Dec. 6th). Looking north.

Rebuilding Housatonic River Bridge of the New Haven Road at Sandy Hook, Conn.; December 4th and 5th.

Morning of Dec. 6th (not Dec. 5th). Derrick car placing rangers on top of intermediate tier. Five horses to meet.



Dec. 7th, 2 p. m. Patent pile driver crossing bridge to take siding and clear for first train to cross.

Rebuilding Housatonic River Bridge of the New Haven Road at Sandy Hook, Conn.; December 6th and 7th.

ber 7th at 2.46 p.m., just 18 days and 4 hours from the discovery of the fire, and about 14½ days from the time the first timber was framed.

Alternating Current Electric Systems for Heavy Railroad Service.

[In the *Railroad Gazette* last week was published on pages 302 to 309 an abstract of a paper on this subject, read before the New York Railroad Club, by Mr. B. G. Lamme, of the Westinghouse Electric & Mfg. Co., together with a comment by Mr. W. J. Wilgus, Vice Prest., N. Y. C. & H. R. R. R. An abstract of the further discussion by Mr. Calvert Townley, N. Y., N. H. & H. R. R., and Mr. Frank J. Sprague, of the New York Central Electric Commission, is given here.]

Mr. Townley.—I think too much credit cannot be given Mr. Lamme for his persistent and long continued effort in developing and pushing forward to its present position the alternating current system. Some one has got to get behind every new development and put his entire energy into it before it is successful, and as you very well know that is generally a thankless task.

Interesting comparisons between electric and steam operation have been made, the cost of installing and the operation of various systems have been discussed, and the results obtained by the use of any of the electrical systems have been compared with those obtained by the use of modern steam locomotives. It seems to me that, valuable as is all this discussion, in a sense it is misleading. The electric locomotive, however much we may admire it, is a very new baby; the steam locomotive has been through years of development, and with all its complicated mechanism it has been perfected to a high degree. No one expects or claims that the electric locomotive as it appears to-day will be the electric locomotive of ten years hence. All that can be said of it, is that it is the best available now, and that best seems good enough to try. Further, the chances are in favor of a decreased first cost, and of reduced operation and maintenance charges as time goes on, so that any comparison neglecting these probabilities is consequently incomplete and faulty. Further, from a much broader standpoint, a comparison between electric and steam locomotives is in many respects like a comparison between their prototypes—the trolley car and the gasolene motor car, or any of the self-propelled and self-contained vehicles, that is to say, the self-contained unit has only available the power generated by and within itself, and it is, therefore, absolutely limited in the amount of work which it can do. The power limitations of the steam locomotive have existed from its beginning, and as they have had to be reckoned with, the road-bed, bridges, rolling stock and train operation, all have been arranged accordingly.

It is not surprising, therefore, that even the contemplation of a service readjusted to take advantage of the removal of this limitation requires a complete mental revolution, which the mind of the steam railroad engineer finds it difficult to make. To illustrate this point, we may consider that the electric locomotive is, in fact, the equivalent of a steam locomotive with its boiler removed and set up some distance away, and that a system equipped with electric locomotives, or with multiple unit cars, is the equivalent of a large number of steam locomotives, with all their boilers removed, rolled into one and placed some distance away. The electric system is simply the connecting link between these boilers and the driving wheels of the several engines on the road. This means that for the power developed by any one locomotive, instead of the limitation of the amount of coal one fireman can shovel into its one firebox, or by the amount of steam which that locomotive's cylinders will take, there is available at the drivers of each machine practically all the power generated in the entire power house boilers, that is to say, a steaming power represented by the amount of coal which all the firemen on all the locomotives can shovel into all of their several fireboxes. This statement of the case is, of course, not literally true in the last analysis, but it is so in principle, because of the fact that the electric system being a means of transmission only will attempt to transmit all the power supplied to it by the prime mover, and that it further has the ability to perform for considerable periods of time very far in excess of its normal capacity.

In handling heavy freight traffic, or even high grade passenger traffic, instead of having to keep down the length and weight of trains in order to obtain the necessary speed, instead of being limited to a certain maximum locomotive weight by the strength of bridges and other structures, instead of being hampered by the consideration of maximum sized wheel base and the maximum weight per driving axle, by using two or more locomotives, connected together by the multiple unit system, it becomes feasible to get practically any amount of speed and any amount of tractive power that is needed to perform a given service. It follows that the size of train units, whether passenger or freight, can be increased up to any extent desired, and be limited only by the strength of the draft gear of the rolling stock.

The track capacity of any given road can be materially increased by the substitution of electric traction for steam, and without the expenditure of one dollar for new rights of way for the construction of additional tracks, and for the strengthening of expensive bridges, trestles, etc. I see no escape from this conclusion. The value of this increased track capacity is difficult to appreciate. Take, for example, a community whose business growth depends upon its railroad facilities. When those facilities have been outgrown it often is a long and a difficult, if not an impossible task, to expand them, that is to say, to procure rights of way for additional tracks through a congested district where they are badly needed, is frequently so difficult and expensive an undertaking that such tracks are never provided, and a further growth of that community is, in consequence, correspondingly hampered.

If my logic is correct, and by the substitution of electricity for steam it becomes feasible to materially expand the traffic capacity of a choked up and congested section of railway by a material percentage, this consideration far outweighs in importance any comparison of the relative costs of the engine mile of steam and electricity. I do not mean by this that the cost of the engine mile is not important, nor that we do not expect to obtain a material reduced cost by the substitution of electric locomotives, but I want to emphasize what I regard to be the far more important side of this question than that which has heretofore been given greatest prominence.

If any of you will study for a short time the railroad map of southern New England, you will be impressed at once with two prominent facts; first, that the New Haven system is not a single line stretching across the country, but is a more or less complete network of lines ramifying among the numerous manufacturing towns throughout the states of Connecticut, Rhode Island and Massachusetts. This fact naturally means many short distance runs, and a comparatively large number of trains in a given district. Two conditions to meet which electric traction is particularly well adapted. You will also see that for a considerable part of the distance, tide water is reasonably near; in fact, within easy electrical reaching distance. This condition, and the fact that there are numerous water powers throughout the New England hills, affords ample opportunity for the cheap generation of power. If, therefore, with short hauls and congested traffic, and if with an abundance of cheap power, the New Haven system is not especially designed and located for operation by electricity, I doubt if you will find a large railroad system anywhere that is.

Bearing in mind, then, the numerous possibilities of complete electrification, and the favorable conditions of the New Haven road, which we have just named, it was absolutely essential that, in considering the question of initial electrification, there should be borne in mind not only the immediate requirements, but also the possible future duty which this road would have to meet, and to select an electric system suitable thereto, and which would impose as few handicaps on future expansion as possible. It is our view that in selecting a method of operating by electricity, first consideration should be given to reliability, including safety, and second, to first cost and low operating charges. From this point of view you will note that in the system which we have adopted, and which has been described by Mr. Lamme (single phase alternating current) our selection has been particularly happy.

Starting from the power house bus-bar, there will be but one link in the transmission of energy to the locomotive, namely, an 11,000 volt trolley wire. Had we adopted a system of high tension transmission, with rotary converter sub-stations, there would have been no less than eight links, instead of one, that is to say, 1st, an 11,000 volt, three-phase transmission line; 2d, a high tension sub-station switch-board; 3d, a set of step-down static transformers; 4th, a rotary converter; 5th, a D. C. switchboard; 6th, a storage battery; 7th, a system of direct current feeders, and 8th, a 600 volt third rail.

None of these links are bad in themselves, but it must be admitted that there is a greater danger of interruption to service, and a greater opportunity for misfits in the eight opportunities for trouble as against one.

It might be possible, of course, that opportunities for trouble on a high tension trolley line, such as is proposed, would be so great as to offset the apparent disadvantage just cited, but such an assumption is not warranted by any logic based on existing alternating current transmission practice, or past experience in the operation of single-phase motors.

On the ground of first cost, the single-phase alternating current system is far in the lead; in fact, it is doubtful if electrification on a large scale would be warranted at all if no other method than that of continuous current with rotary sub-stations were available.

The electrification of the New York division, 61 miles, from Woodlawn Junction to New Haven, and the possible future extension to New London, Hartford, Springfield, Providence and Boston, must provide both for a suburban service and for through traffic. The latter comprises heavy units, and the train intervals are infrequent as compared with the intervals ordinarily prevailing in trolley service. On this account the maximum drafts of power are very greatly in excess of the average consumption, and it will be these maximum drafts, and not the average consumption, which

must determine the capacity of each part of the distribution system. This means that in an alternating current transmission system, with rotary converters, the sub-stations must be placed close together, and the capacity of each station made abnormally large, with the consequence that the first cost becomes alarming, if not prohibitive.

With the alternating current, 11,000-volt trolley, on the other hand, a single 4/0 trolley wire over each of four tracks has ample electrical capacity for the heaviest demands that are likely to be made upon it. I think it needs no further argument to demonstrate the enormous advantage in the matter of first cost of the system which we have adopted.

In operating charges, it is noted that the single-phase alternating current system eliminates at once all the labor and other expenses connected with sub station operation, and it is, of course, relieved, likewise, from the heavy fixed charge due to investment in those stations. It is further relieved of the constant losses of transformation, and of the loss due to the very considerable drop in the 600 volt secondary distributing system. This will mean a saving in power output averaging at least 10 per cent., this being, if anything, an under rather than an over statement of the facts.

It was supposed a year ago that possibly the single-phase system would be handicapped by a very heavy and a very expensive locomotive, which would be subject to a further disability of design, in that the motors must be geared to the driving axles, instead of being direct connected. These objections, it is now known, have disappeared. The motors are made of the gearless type, and judging by factory tests of our first locomotive, the other imaginary disabilities have also vanished.

A further important consideration to us has been the flexibility with which the electric system might be extended in the future to branch lines. It is likely that we may be called upon at any time to reach out a considerable distance and handle, by electricity, a limited and infrequent service. This can be accomplished by the use of the 11,000 volt single-phase trolley, at a very moderate construction expense for an overhead structure, and with no fixed operation and maintenance charge such as would be necessary were a rotary sub-station required.

Considering the advantages which I have enumerated, and I have by no means stated them all, simply referring to the most important ones, I do not see that the engineers of the New Haven road had any alternative but to select the system which has been chosen. The only difficulty which presented itself was the necessity for operating on the continuous current system between Woodlawn and the Grand Central station, but when it was found that the single-phase locomotive, with but slight additional complication and expense, could be made to operate with equal facility on either the continuous or alternating current, this remaining difficulty promptly disappeared. I desire here to call attention to one fact, which, although we all know it, remains so frequently unsaid as to be sometimes forgotten in a comparison such as I have drawn. I refer to the fact that the alternating current single-phase system, while it can be used at any desired tension on overhead trolley where the continuous current cannot, it can also be used on a third rail or any other form of conductor, and at any tension, low or high, that may be best adapted for the service. That is to say, in passing through a city or town, or under bridges or tunnels with insufficient clearance, it is always possible to step down the high trolley voltage and run for such distance as may be necessary at any other selected voltage, the current being collected either from a third rail or otherwise. It is obvious that a system which lends itself to practically any form of transmission, and any form of current collectors, and that may be used with any other system, cannot be charged with weaknesses attending the use of a particular type of conductor. I regard this flexibility as a very valuable feature of the single-phase system.

Mr. Wilgus criticises Mr. Lamme's description of the overhead construction as failing to provide for operation in case any section of a line should be disabled. If you will refer to Mr. Lamme's paper you will find that this criticism is not well founded, as provision has been made for a continuous feeder running the whole length of the overhead structure, which feeder is so arranged that by means of automatic cut out switches any section of track may be entirely cut out of service, and the sections beyond remain undisturbed. I might also point out that each individual trolley wire is likewise protected at the end of each two mile section, so that one, two or three of the four tracks in any sections may be cut out of service and the remaining ones be undisturbed.

The New Haven road also has a somewhat different problem of electrification, because through the Consolidated Railway Company, the New Haven road owns and operates several trolley properties adjacent to its steam lines. It is not unlikely that a number of branches heretofore operated by steam may be electrically equipped and operated in connection with one or more of the trolley lines, affording a frequent intercommunication between adjacent centers not feasible in steam railroading, and at a moderate expense. By equipping such lines with the single-phase trolley system, and providing rolling stock that may operate either on that system or over the continuous current trolley systems referred to, it becomes possible to take advantage of the opportunities just described, and at the same time to maintain a uniform method of electrification adapted alike to sparsely settled and to congested districts. I believe that this plan if carried out will result in great benefit to the communities served, and will be no small factor in the commercial development of southern New England.

Mr. Sprague said: Referring to Mr. Lamme's general description of the three principal methods of operation, each was practicable and had certain specific advantages, but he must condemn the assumption that past practice measured the limit of potential in d.c. operation. He had predicted raising the direct current standard for some classes of work to at least 1,500 volts, and wished to repeat without reserve that not only was this increase possible with modified forms of construction, but it made practicable the resuscitation and adaptation for locomotive use of early and effective methods of variable speed control.

It had been incorrectly stated at a former meeting of the club that a continuous current locomotive had but two economic speeds. In the ordinary two-motor d.c. equipment the motors were given two impressed electromotive forces, half and full, by the series parallel control, and with a four-motor equipment there were three impressed electromotive forces; in each combination there was for any definite current and torque a certain speed, but with each the entire range of speed after leaving the resistance control was an economic one.

Since it had been stated that the power to make up time was one of two factors which alone would be sufficient reason for adoption of single-phase operation, it was of special interest to note that Mr. Lamme emphasized the fact that even with the plain series motor there is possible a wide range of economic speed control by field variation alone while maintaining a constant torque. Hence this assumed advantage seems to have already largely disappeared.

The special improvements which had been referred to made possible a range of several hundred per cent. in economic speed at will, with any desired gradation, and a like range of return of current to the line where such was advisable. These developments contained the promise of effective results in certain difficult classes of railroad operation.

It had been stated that the storage battery as a reserve was available to the single-phase a.c. system, but of course the only possibility was by the introduction at sub-stations of rotating machinery, held to be such a bugbear in d.c. operation, and then only under conditions of serious energy losses, as illustrated in the plans of a certain western road. There a polyphase synchronous a.c. motor is to drive a single-phase generator, and to the same shaft is coupled a direct-current machine which with light line loads will charge the storage battery, and when the line load increases, with consequent slowing down of the synchronous motor, it will reverse its function, and taking current from the battery help drive the single-phase generator. About half of the electric energy, after leaving the original power station, will undergo six transformations, and the other half ten transformations before reaching the motors on the car.

Much had been said on the subject of electrolysis, which trouble had been held as individual to the d.c. system. That such has taken place was undeniable, but largely because of local conditions. Most electric railways in the localities instanced had their tracks laid in intimate contact with the earth. They ramified in all directions on streets filled with leaky sewer, gas and water pipes. The ground was at times saturated with rain and other liquids—with resulting conditions especially favorable to electrolysis. On a trunk line railway conditions were essentialy different. Heavy traffic rails of enormous current capacity were carried on wooden sleepers embedded in well drained broken stone ballast. Being on a reserved right of way they were well removed from gas and water pipes, and little apprehension need be felt. In this connection he quoted some recent remarks by Mr. A. P. Trotter, the electrical expert of the British Board of Trade, under whose jurisdiction all electric railway installations in England were now made, as they appeared in the February, 1906, issue of the *Transactions of the Faraday Society*, of which Lord Kelvin is President.

Mr. Sprague said that it is not the volume of current on the rail that determines the amount of electrolysis, but the difference and character of potential which exists in the different parts of the track and the facility offered to the flow of current because of that difference of potential to other metal conductors. But the single-phase a.c. system had a special difficulty of its own. When using pressures as high as 11,000 volts, even with only 5 per cent. loss on the rails there would be a mean difference of potential on the tracks of 550 volts, with a maximum of nearly 800 volts. Leaving out the question of electrolysis, which there is good reason for believing will take place, there were possibilities of serious interference with lightly insulated telephone and grounded telegraph serv-

ices, the latter operating with phantom circuits in the duplex and quadruplex systems.

Referring to the economic advantages of high tension operation, he reminded his hearers that he had always been the advocate of higher potentials, and believed that whether with a.c. or d.c. currents it would be necessary on occasion to go to the highest permissible limits, but here again came up a new point for consideration, for the higher the potential the greater the necessity for concentrating motor equipments in a single unit, whether it be a car or locomotive, for we could not view without apprehension the project of introducing into the several cars of a passenger train made up wholly or partly of motor cars of the very high potentials contemplated in long distance infrequent locomotive service. It is therefore quite possible that different standards of potential would be adopted on different parts of the same line.

In discussing pressures, conductor capacity and costs, some elemental facts should be borne in mind. When subjected to single-phase currents all conductors labored under some of the same disadvantages as does a motor, and an iron track rail especially so. Under average conditions as to size, frequency and power factor a copper trolley wire will offer about one and a half times, and a steel rail about six and a half times as much total apparent resistance to a single-phase alternating current as the same conductors will offer to a direct current of like volume.

Comparing the actual capacity of tracks and conductors as to be installed on the New York Central and on the New Haven, the total apparent resistance per mile of the latter will be about six and a half times as much as that of the former to like volumes of the two currents. This practically meant that if the two roads had sub-stations the same distance apart then with the same loads and line losses the mean pressures required on an a.c. system would be over two and a half times as much as on the d.c., and the maximum pressure over three and a half times. For example, operation with a direct current at 1,500 volts would give the same line losses as operation with a single-phase a.c. at a mean pressure of about 3,800 volts and a maximum of 5,400.

Mr. Townley had stated that in place of the normal high tension overhead trolley a low pressure third rail could be installed wherever along the line limited tunnel and road crossing clearances will not permit the former, and also that terminal yards could be similarly equipped. Momentary shiftings from high to low pressures and vice versa are not enviable operating conditions. With a tunnel of some length and in yards an a.c. third rail is possible, but only and with special construction. Single-phase operation is essentially a high pressure and copper conductor proposition, and the ordinary steel third rail is practically barred to it. The mean a.c. pressure can only be about seven-tenths of that allowable on the d.c. system, with resultant current increase irrespective of how it is transformed. On account of the high rail impedance the result is very much as if on a d.c. system the pressure were reduced a third, and with the increased current a 10 or 15-lb. rail were generally adopted. A copper conductor should therefore be used, and even then the low power factor, the greatly increased currents, the extra resistance of the equivalent copper conductor and the high impedance of the traffic rails would constitute serious operating limitations.

Statements as to the cost of working conductors were misleading. The constant tendency of the times is to require the abolition of grade crossings, and when established in congested districts they cannot be changed save at great expense and risk. Even in the country the tendency is to make the clearances as small as possible to avoid unnecessary grades on either the railroad or the street, and when the railroad is the lower the changes necessary to insure reasonably safe conditions for carrying a high potential a.c. trolley wire by present methods are necessarily costly, and must be added to the capital account chargeable against electric equipment on this plan. Changes in levels and alinement of tracks, as well as the addition of sidings and running tracks, must also be anticipated.

Single-phase, polyphase and continuous current motors have different characteristics. The first gives an intermittent drawbar pull, the others a continuous one. In a 25-cycle single-phase machine for 50 times a second the torque produced by the reversible and variable current rises from zero to a maximum of nearly half as much as the mean, while in the continuous current and the polyphase motors the maximum torque is practically the mean for any given conditions. The result is two-fold; first, the latter machines, since they receive a continuous instead of an intermittent delivery of energy, are not only lighter but more economical; and second, for equal drawbar pull it would seem that the actual weight on the drivers of a single-phase locomotive must necessarily be considerably in excess of that required for the others, or else when pushed to the limit there would be a periodic slip.

A comparison of two locomotives appeared to bear out this contention. The New York Central d.c. machine has about 70 tons weight on the drivers, its motors measured on the hour rating and without special ventilation aggregate 2,200 h.p. capacity, and it is guaranteed to handle trains having a total weight of from 400 to 550 tons, according to schedule required. The New Haven a.c. locomotive is reported to have 72 tons on the drivers, to have an hour rating without ventilation of only 1,000 h.p., and is intended to handle trains of 200 to 250 tons.

It has been popularly stated that while cars equipped with single-phase a.c. motors cannot accelerate as rapidly as those equipped with like capacity of d.c. motors this is not a matter of importance when dealing with locomotive drawn trains making infrequent stops. Whatever disadvantage there may be in this respect it is equally present whether a single-phase motor be used under a car or in a locomotive, for in either case it will probably be operated up to the slipping point of the wheels, and the gist of the criticism, of course, is that there is required a greater ratio of weight on the drivers to get equal acceleration, and the heating of the motors is more pronounced. This is a matter of considerable importance when attempting the quick accelerations which are necessary for high schedules with frequent station stops, and it is pertinent to operation on the New Haven road, where within the district to be operated by single-phase current the station stops and the schedules are practically the same as those of the New York underground railroad, on which d.c. motors are used and 43 per cent. of the weight of the train is carried on the drivers.

Mr. Sprague held that the polyphase motor, admirable a machine as it was, has but limited possibilities in railway service, and was largely confined to single units. For multiple unit operation it was impracticable under the ordinary conditions of railway operation because of the small air gaps and the difference of duty with varying wheel diameters.

Comparing the direct current and single-phase motors simply as machines, he said that the former with equal development must always be the better, for it is of simpler construction, is lighter and more economical, has a larger air gap and runs at a slower speed. It has from a half to a sixth of as many sets of brushes, can always have a series winding for the armatures, can be operated at a higher individual potential, and sparking at the commutator can be more readily eliminated. Heating is less, for the transformer action is absent, and the torque is constant instead of intermittent. The claim that a motor built for successful operation on single-phase currents must necessarily be the best kind of machine for d.c. operation was not borne out in theory or in practice. If so there would be no valid excuse for maintaining dual manufacture.

Iowa, Vermont and Prussia.*

The apprehensions of my friends seem to cluster about the idea that if this law passes, New England will suffer from the incubus of what are termed "commission rates"; that we shall be afflicted with a touch of "Government rate making." While there is not the slightest foundation for any assertion of this sort, I want to inquire for just a moment whether if this were possible it would necessarily be an unmitigated evil for New England?

The State of Iowa is about the size of all New England combined. It was one of the first states to create a commission with power. For the last thirty years the maximum rates of Iowa have been fixed by its Commission. While there was objection at the outset that these rates were too low, there is little or no claim of that sort to-day. Its railroads are prosperous, and its railroad service excellent. Taking New England as a whole and considering all conditions of construction and operation, we ought to enjoy as favorable freight rates as Iowa.

The State of Prussia, which, as you know, is the largest in the German Empire, is about twice the size of New England. It owns and operates nearly or quite all its railways at the present time, and prescribes the absolute rate for railway transportation. I live at Newport, in the northern part of Vermont, and I have had the curiosity to compare some of the rates which we pay with those which are made by the Commission of Iowa and the Government of Prussia.

Potatoes are a commodity extensively raised and shipped to market in New England. The rate from Newport, Vermont, to Boston, a distance of 250 miles, is 19 cents. In Iowa the rate for a similar distance is 12½ cents; in Germany, 9.6 cents. The great potato-raising section of New England is Aroostook County, Maine, an average distance of 400 miles from Boston and 600 miles from New York, the rate being 21 cents to Boston and 29½ cents to New York. The Iowa tariff for 400 miles is 20 cents. They have no distance as great as 600 miles. The Prussian tariff is 13½ cents for 400 miles and 18½ cents for 600 miles.

Another article in which the farmers of northern Vermont are largely interested is hay, which it costs us 17 cents per 100 lbs. to send in carloads from Newport to Boston. In the State of Iowa the same service would be rendered for 11 cents, while in bureau-ridden Prussia it would cost 10½ cents. We are also manufacturers

*From a paper by Hon. Charles A Prouty, Interstate Commerce Commissioner, read before the Massachusetts State Board of Trade, Boston.

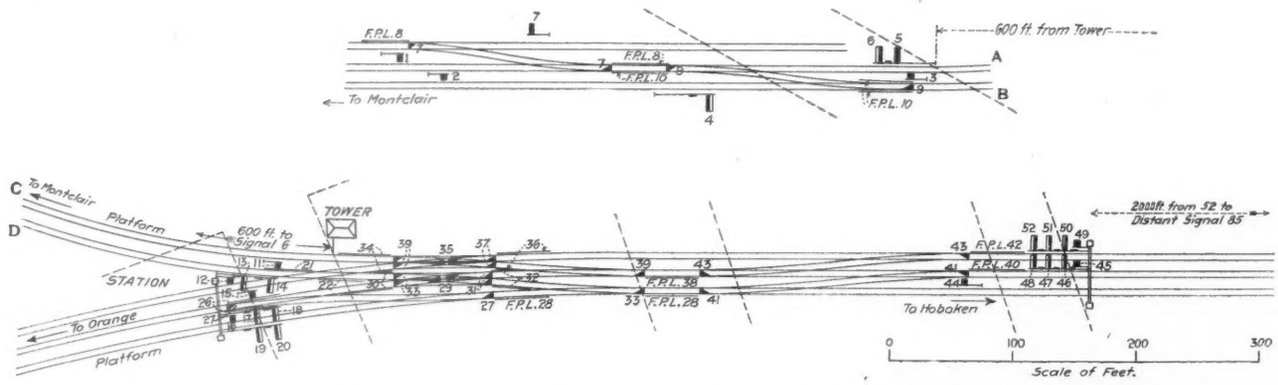


Fig. 1—Switches and Signals at Roseville Avenue, Newark, N. J., Delaware, Lackawanna & Western.

A part of the Bloomfield Branch (signals 1 to 7) is cut off and shown by itself.

of butter, upon which the rate in carloads from Newport to Boston is 46 cents. In Iowa the tariff for a corresponding distance is 26 cents and in Prussia 36 cents. Our principal industry at Newport is lumber, upon which we pay a rate to Boston of 10⅔ cents; to Hartford, Conn., 256 miles, 15 cents. The Iowa lumber rate for 240 miles is 9¼ cents; for 256 miles, 9⅝ cents. The Prussian tariff for 250 miles is 6.4 cents.

Going now in the other direction, I find that the rate on sugar in carloads from Boston to Newport is 19 cents; that the Iowa tariff for a corresponding distance is 17.1 cents, while in Prussia the charge is 10.9 cents. Fertilizers in carloads take a rate from Boston to Newport of 17 cents; in Iowa the distance tariff is 9½ cents; in Prussia, from 7.7 to 9.8 cents.

It is possible that rates can be found which are lower for corresponding distances in New England than they are in either Iowa or Prussia. I know of none. These figures fairly show that the rates of Iowa are materially lower than those of New England, and that those of Prussia are lower still. I would be glad to have some of these gentlemen who stand horrified when you talk of a commission rate or a Government rate make plain just how it is that the payment of these charges from 10 to 33⅓ per cent. higher is of such enormous benefit to the people and the industries of New England.

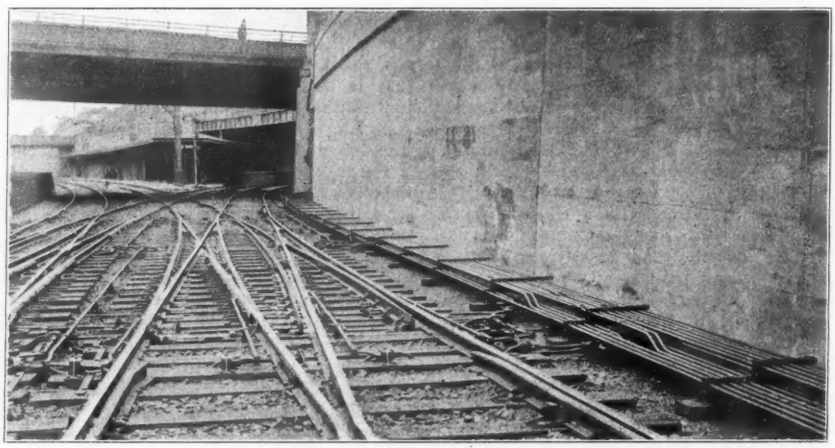


Fig. 3—Slip Switches and "Double-Deck" Signal Rod Lines.

Interlocking on the Lackawanna at Roseville.

The signal department of the Delaware, Lackawanna & Western has lately finished an interlocking plant of 49 levers at Roseville avenue, Newark, N. J., in which a number of interesting details have had to be designed especially for the location, and some of these details are here described. Roseville avenue is the junction of the main line of the Morris & Essex division with the Bloomfield branch, leading to Montclair. The grades of both the main line and the branch have lately been depressed, so that the whole of the roadway shown in the drawing, Fig. 1, lies in a narrow cut between vertical concrete walls. That part of the drawing showing the signals on the branch has been separated from the part showing the main line in order to bring it within the space of a page. All of these branch signals (Nos. 1, 2, 3, 4, 5, 6 and 7) are entirely hidden from the cabin. Both main and branch lines are equipped with automatic block signals, and therefore no distant signals are shown in the plan, all of these being at the farther ends of the

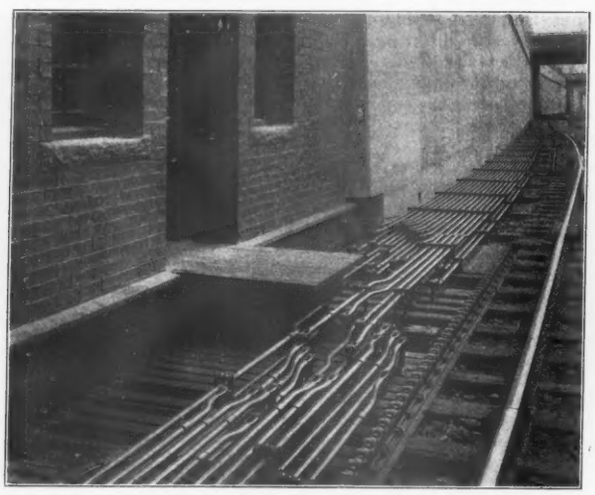


Fig. 4—Leadout, Looking East.

Fig. 2—Roseville Avenue Signal Cabin, Looking West.

block sections terminating at signals 4, 20, 48 and 52. The main passenger-station building is between the main line and the branch, close to the intersection of the tracks. The tracks farthest from the station, both on the main line and on the branch, have separate platforms and stairways on the farther side.

The front of the signal cabin, a frame building, facing the track is flush with the wall of the cut, as shown in Fig. 2, and its main floor, 23 ft. above the tracks, is entered directly from the street which crosses the railroad on a bridge. The three overhead bridges crossing the main line and one on the branch are shown in dotted lines in Fig. 1. The machine has room for 52 levers, three of the spaces being spare. Of the 49 working levers, 25 are for signals, nine for switches, 13 for locks and bars, and two for movable point frogs.

The lower story of this building is virtually a chamber in the retaining wall, and it is used for a storage room and repair shop. The interlocking machine, which was furnished by the Union Switch & Signal Company, is a Johnson, with vertical locking. The Johnson pattern, with a few modifications, is standard on the Lackawanna, the principal modification being the provision of slots for locking the tappets in both the normal and the reverse positions. These are added in order to insure the proper stroke of the tappets in case the machine becomes worn. The electrical apparatus, referred to below, was also furnished by the Union company.

Of the three tracks in the main line, the middle one is signaled so as to be usable either eastbound or westbound. In the morning it can be used for express trains toward New York (Hoboken), and in the afternoon for the same class of trains from Hoboken westward. The cross-overs have number 12 frogs, enabling trains to pass from one track to the other at 30 or 40 miles an hour. Signal 52 is for a westbound movement on the right-hand main line track, signal 51 for a main line movement to the branch, signal 50 for a movement to the middle track westbound, and signal 49 for any other movement from westbound main track through the junction.

Elaborate electric locking and indicating apparatus is provided. There are repeaters in the tower for all hidden signals, train indicators to give automatic notice of the approach of trains, and a train "describer," worked by the signalman at Newark, by which full information is received concerning all trains from the east. Telephones connect with the adjacent stations.

As shown in Figs. 3 and 4, the gas pipe rods to switches and signals for each direction from the cabin are arranged in two groups, one above the other, making a "double-deck" line. The arms on the rocker shafts are 7½ in. and 9 in. The 7½-in. arms operate the rods for the lower deck, and the 9-in. arms those for the upper deck. In order to maintain the established 7½-in. stroke the levers

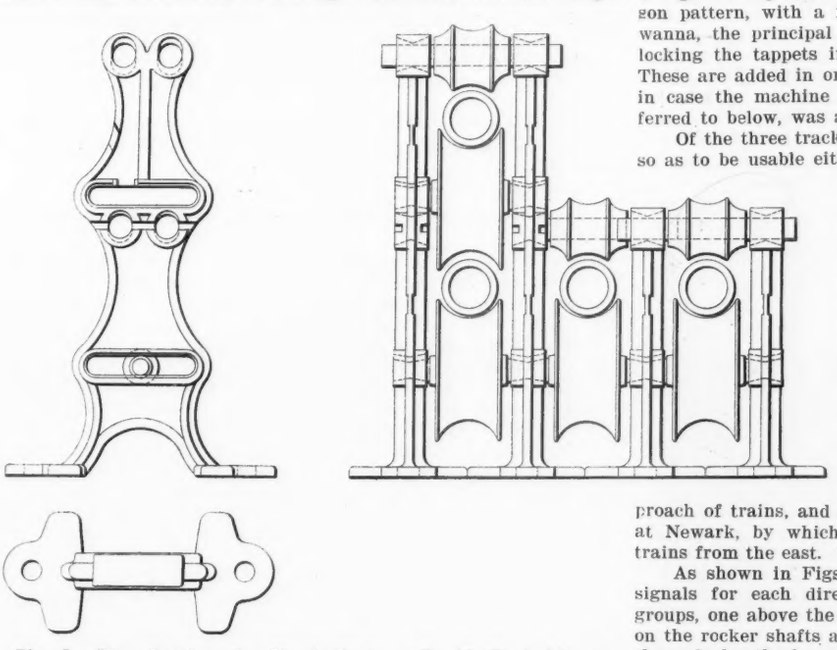


Fig. 5—Pipe Carriers for Single-Deck or Double-Deck Lines.

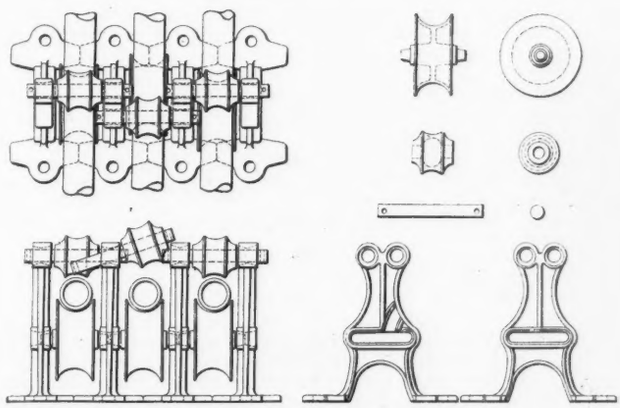


Fig. 6—Details of Pipe Carrier.

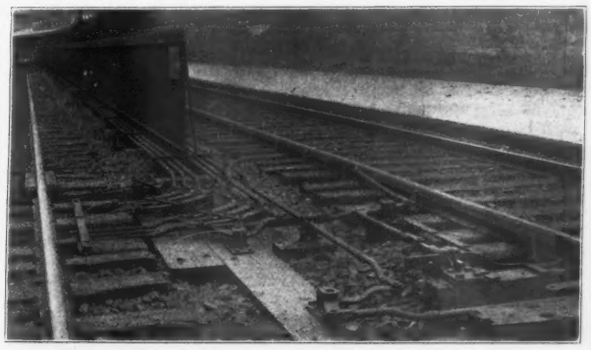


Fig. 7—Signal Rod (Pipe) Line and Fence, Showing Deflector Bars.

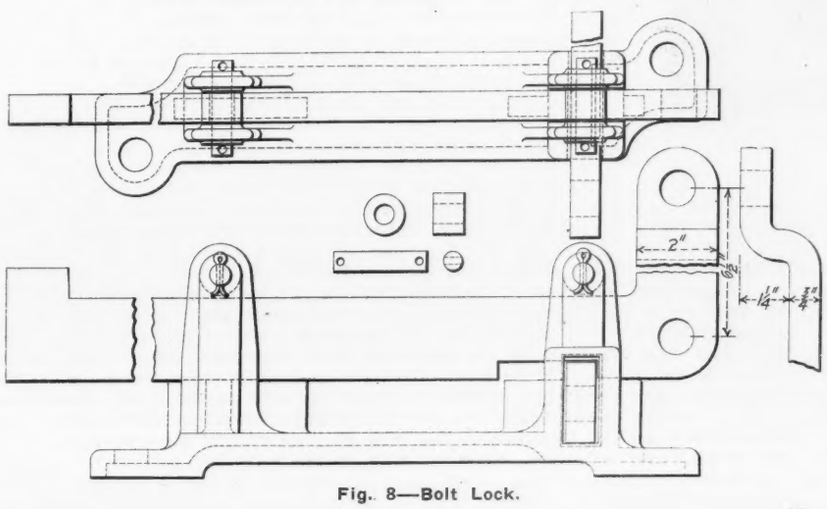


Fig. 8—Bolt Lock.

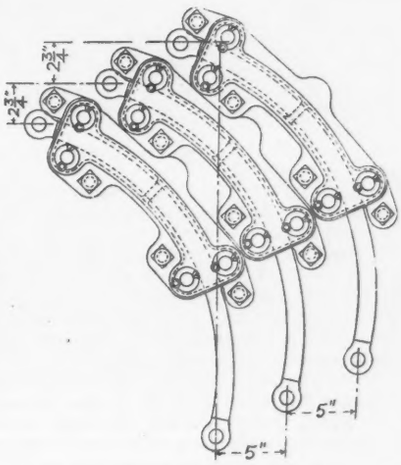


Fig. 9—Stockdill Deflector Bar.

operating the lower deck, both the up and down rods, are placed at 8½ in. throw on the tail levers.

The pipe carriers, illustrated in Figs. 5 and 6, are of malleable iron, and have been designed for the double-deck arrangement. The foundations for the pipe carriers have iron uprights with wood tops. All other foundations, including those for cranks, compensators, bolt locks and wheels, are malleable iron piers imbedded in concrete. Owing to the lack of room on the Bloomfield branch, the pipe line had to be put part on one side and part on the other of the fence between the eastbound and westbound tracks, as shown in

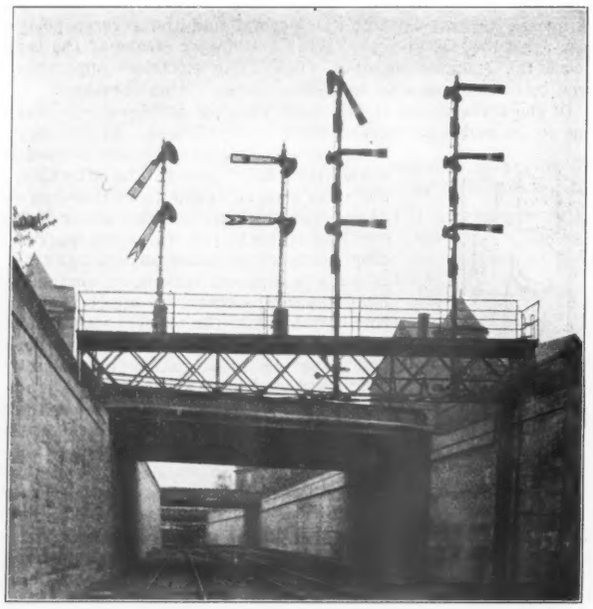


Fig. 10—Main Line East of Junction; Looking West.

Fig. 7. It will be noticed that the pipe line is in no way connected to the fence proper, though it is secured to the same foundations. The pipe used in the pipe line is of 1-X wrought iron, and weighs 217 lbs. per 100 ft.

Starting east from the cabin, there are 14 leads on the upper deck and 15 leads on the lower deck; and there are 10 leads on the lower deck and 8 leads on the upper deck running west from the tower, making 47 leads in all. As the switches are successively

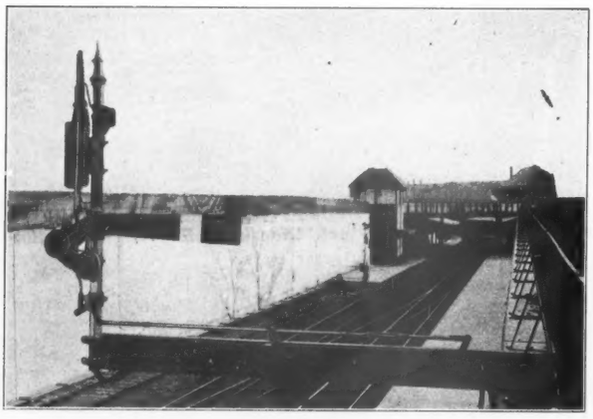


Fig. 11—Signal No. 4.

reached, the lower pipes are dropped out, one after another, and the upper pipes are brought down to take their places, as is clearly shown in Fig. 3.

All front rods and head rods are adjustable, and the head rods are also provided with gages so that overthrow can be provided for. All of the main line signals are slotted, and they bolt-lock all switches through which they give right to move. The detector bars are 50 ft. long, and each has 14 Kelloway patent detector-bar clips.

The deflector bars which appear in Fig. 7 are shown in detail in Fig. 9. These bars slide between fixed rollers, and when kept thoroughly lubricated are said to give satisfactory results.

In Fig. 8 is shown a bolt lock made with a vertical arm to fit it for use where the pipe lines are arranged in two "decks." To keep the rod clear of the pipe line there is an offset, as shown.

Fig. 10, looking west, shows, on the right-hand post, signals 50, 51 and 52. The signals for the eastbound tracks on this bridge are automatic.

The distant signals connected with this plant are fitted with electric locks to insure to a train a route which it has once accepted. For example, home signal 52, when cleared, automatically clears distant signal 85. The distant, when it reaches the clear position, opens a circuit breaker, which has the effect of locking the latch of 52, and keeping it locked until the train has passed the home signal, and till the distant arm (85) goes back to the horizontal position. The locking of the latch of 52 prevents putting that lever home, and therefore prevents the signalman from clearing any conflicting route; though he is not prevented from throwing arm 52 to the stop position in case an emergency should make that desirable.

For information concerning this plant we are indebted to Signal Engineer M. E. Smith and General Foreman of Interlocking C. J. Kelloway.

The Engineering and Maintenance of Way Association Convention

The seventh annual convention of the American Railway Engineering and Maintenance of Way Association was held in the Auditorium Hotel, Chicago, March 20, 21 and 22. It was the largest meeting the association has yet had, the attendance being over 200 out of a total membership of 528. New members admitted during the year were 102; dropped from the roll, 37; net gain, 65. The cash balance in the treasury was $9,949. The 1904 amendment to the constitution made the term of office of president and vice-president two years; but First Vice-President James Dun (A., T. & S. F.) having resigned, Second Vice-President A. W. Johnston (N., C. & St. L.) was elected First Vice-President and Walter G. Berg (L. V.), Second Vice-President. The other officers elected for the ensuing year were: Secretary, E. H. Fritch; Treasurer, W. S. Dawley (re-elected); Directors for three years, W. C. Cushing and J. P. Snow.

President H. G. Kelley called the convention to order at 10 o'clock, March 20. His address reviewed briefly the past year and contained suggestions for the present year. Reference was made to the representation of the association by invitation of the President of the United States, on a national advisory board on fuels and structural materials. The membership of many managing officers is a cause of gratification and also emphasizes the principle of the association that its work must be marked with conservatism and its recommendations adopted only after most thorough consideration. After reviewing the important committee work, reference was made to the publication of the first volume of the association's Manual of Recommended Practice, an event of considerable importance in the history of the association. Progress toward partial electrification of steam roads was touched on, and the fact that the new conditions arising will in the immediate future require the attention of the association.

Committee Reports.

Ties.

This committee has met twice by itself and also has met with the track committee. With the last named an attempt was made to prepare a formula to show, for three types of track, the right lengths of ties and right spacing, but it was found impossible to formulate any rule which would be of value. One member, however, has made a study of the theory of spacing, which the committee prints in an appendix. The committee resubmits, with corrections, the specifications for ties presented last year. The use of dating nails in ties has been the subject of considerable discussion. Copper nails are stolen and steel corrodes. It is suggested that experiments should be made with iron and steel wire boiled in oil and also the same galvanized, with a view to determining the best material.

Everything that the committee has learned during the past year concerning preservative treatment of ties confirms the favorable opinions before expressed. The committee believes that preservatives should be more generally used; but many roads refuse to do anything when the price of ties is low, and then again refuse when it is high because they are unwilling to buy large stocks at the high prices. The report gives some results of the experimental track of the Gulf, Colorado & Santa Fe. The committee recommends for adoption a code of specifications for ties, another of definitions and specifications for a dating nail; also rules for keping tie records. It is recommended that the standard tie be 7 in. x 8 in. x 8 ft. To the report is appended also a code of specifications for tie treatment, which the association is asked to discuss. These are confined to forms of treatment which are neither secret nor patented. Another appendix to the report gives interesting notes from Mr. Kruttschnitt, of the Southern Pacific, and Mr. Faulkner, of the Santa Fe, concerning their experiences in tie treatment. An essay on a proposed standard method for analysis of coal tar creosote and zinc chloride, by Mr. J. E. Moore, of the

Canadian Pacific, which was published in Bulletin 65, is now republished along with the present report in Bulletin 72.

BALLASTING.

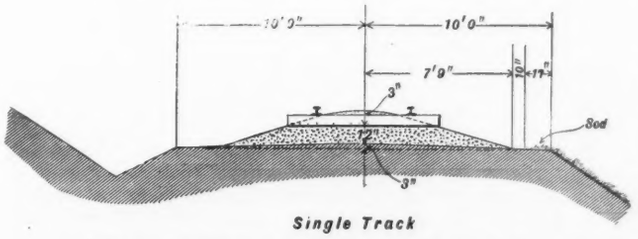
The committee on ballasting offers the following definition of disintegrated granite, a material which is being used to a considerable extent in the West:

"*Disintegrated Granite.*—A natural deposit of granite formation, which, on removal from its bed by blasting or otherwise, breaks into particles of size suitable for ballast."

The following notes prepared last spring by Mr. J. B. Berry, at that time Chief Engineer of the Union Pacific, are submitted:

In the Rocky Mountains disintegrated granite is usually in mass and very compact, with occasional dikes of hard granite sticking up through it to the surface.

The bulk of it may be taken out by a very heavy steam shovel, but we have found it much cheaper to do some blasting. When blasted and picked up, it crumbles into small cubes about the size of peas. The dikes of granite are solid material, and have to be blasted out and thrown to one side or



Single Track

Section for Chert and Cementing Gravel Ballast.

used for riprap. We have been able to load with a steam shovel having a three-yard dipper about 2,000 cu. yds. a day.

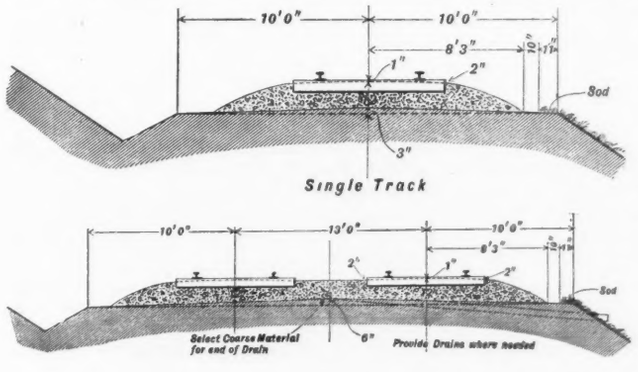
Disintegrated granite runs very easily out of the cars, is of a good size to ballast track, is easily handled under all conditions, becomes quite compact when in the track with little or no dust, will stand hard tamping with tamping bar, is one of the best ballasts to shed water I have ever seen, and we find it more economical, especially in renewals of ties, than any other kind of ballast.

We have used about a million yards of disintegrated granite for ballast within the last three years and can report as follows:

	Average cost, per cu. yd.
Cost loaded on cars at pit	9.19 cents.
Labor unloading from center dump cars and putting under trk	13.37 "
Tools, engineering and miscellaneous expenses	0.76 "
Total	23.32 cents.

Weight of ballast, 3,000 lbs. to cubic yard.

This cost includes everything except haul, and each company must decide for itself what it costs to haul ballast per cubic yard. The items I have given included tools and their repairs, powder and fuses, steam drills, wages of pit employees, labor putting ballast under track, repairs to cars, wages of locomotive engineer, fireman and trainmen who spot cars at the pit, roundhouse expenses, water supply, oil and waste for locomotives and steam shovel, fuel, rental of locomotive and steam shovel and rental of outfit cars.



Sections for Crushed Rock, Slag, Gravel, Burnt Clay, Chats, Cinders, Disintegrated Granite and Sand Ballast.

In other words it includes every expense connected with the handling of this ballast except the haul.

While we did not meet with any granite boulders in our gravel pits, we found a good many seams or dikes of the solid granite throughout the pit and were obliged to shoot these. The loading of these after shooting was done by steam shovel and at times was a little slow, but nevertheless was the most economical method of handling them. The material that was too large for ballast was used for riprap. The expense of this shooting and loading was included in the figures given for cost of ballast, but the yardage is not included.

It probably would be more expensive shooting boulders, as we are able to put holes down the depth of entire face of work. We find it economy to use powder in loosening the face of entire work for the shovel.

Ballast Cross-Sections.—Last year's report showed two sets of ballast cross-sections, a majority and a minority report. These were referred back with instructions to try to reconcile the differences. The members of the ballasting committee agreed on a set of sections, which afterward, with slight modifications, were agreed upon at a joint meeting with the track committee. The sections are shown in the accompanying illustrations.

These sections are in the nature of a compromise between the different sets of sections proposed last year. It was the general opinion that some surface drainage was desirable, if not absolutely necessary, even with such material as crushed rock and slag. This requirement is met by the slight rounding of the surface between ties, the distance to top of ballast at end of tie being one inch lower than at center, and space being left under the rail to allow passage of water. It was also the general opinion that a large body of ballast is necessary around the end of the tie to give support to that part of the material which is directly under the tie. Without this support, the ballast works out and allows the tie to drop. This requirement is met by allowing the ballast to come well up on the end of tie and providing a flat slope from there to the foot. It was thought that a steep slope, equal to the natural angle of repose of the material, had practically no resistance to a disturbing force and that the ballast should, therefore, be put at such an angle as would resist a disturbing force from the start.

Where the ballast contains clay, or material which makes it practically impervious to water, the latter must be carried away on the surface entirely. The importance of a steep slope, in this case, is greater than that of support at the ends of the ties, and a section is provided accordingly. This is shown for cementing gravel and chert. Ballast sections shown are for first-class track only. It was not thought proper to provide for different classes of track until the Association had taken some action on classification. A double track section for cementing gravel was not shown because it seemed probable that a double-track road would use a better ballast.

The report is signed by John V. Hanna, Chairman; C. A. Paquette, Vice-Chairman; C. H. Byers, A. O. Campbell, M. P. Cotton, L. F. Goodale, G. D. Hicks, B. C. Milner, J. O. Osgood, F. W. Ranno, Samuel Rockwell, A. F. Rust, G. M. Walker, Jr.

RECORDS, REPORTS AND ACCOUNTS.

The committee on this subject found itself widely scattered, and the different subjects were therefore referred to sub-committees. These committees report on ledger accounts for individual pieces of work, system for office records of bridges, conventional signs for right of way maps and proposed standard progress profiles and track charts. The standard requirements for drawings of the Pennsylvania Lines West of Pittsburg are given in full; also data on this subject from the Illinois Central, the Nashville, Chattanooga & St. Louis, the Central of New Jersey, the New York Central, the Norfolk & Western, and the Canadian Pacific. The committee submits a standard progress profile and a standard track chart. It holds that ledger accounts with individual pieces of work are essential, and recommends for adoption the definitions which it has formulated and the charts which it has mentioned; but the conventional signs are offered only for discussion.

TRACK.

The committee on track believes that the A. S. C. E. rail section might be improved by increasing the proportion of metal in the base and reducing that in the head. This view is based on reports of frequent breakages which start in the base. The committee recommends the appointment of a committee to confer with the Master Mechanics' Association as to the amount that the gage of track should be widened on curves, with a view to deciding how much the widening should be for different wheel bases and different curves. It is becoming customary to have flanges made on all wheels, and wheel bases are being made longer. The committee desires a full discussion of standard drilling for rails. Easement curves are discussed at length, and a formula is submitted for approval; also rules for the maintenance of gage and the inspection of track.

CLASSIFICATION OF TRACK.

The special committee on Classification of Track recommends that when a district of a railroad has reached the conditions of traffic hereinafter specified, it shall be placed in one of the following classes:

Class "A" shall include all districts of a railroad having more than one main track, or those districts having a single main track with a traffic that equals or exceeds the following: Freight car mileage passing over district per year per mile, 150,000; or, passenger car mileage per year per mile of district, 10,000, with maximum speed of passenger trains of 50 miles per hour.

Class "B" shall include all districts having a single main track with a traffic that equals or exceeds the following: Freight car mileage passing over district per year per mile, 50,000; or, pas-

senger car mileage per year per mile of district, 5,000, with maximum speed of passenger trains of 40 miles per hour.

Class "C" shall include all districts of a railroad not meeting the traffic requirements of Classes "A" or "B."

These conclusions were made from statistics collected by the committee.

The report is signed by Chas. S. Churchill, Chairman; W. M. Camp, Vice-Chairman; C. H. Ackert, D. D. Carothers, W. C. Cushing, W. A. Gardner, W. J. Harahan, Wm. Hunter, J. Kruttschnitt, Wm. Michel, C. A. Wilson and H. R. Williams.

ROADWAY.

This committee presents a long report on the proper wording of the overhaul clause in contracts, dealing with the manner of payment and the method of computing overhaul, but no conclusion could be reached and the reader is left to digest the conflicting views as best he can. This matter fills about 90 pages. There is a tabular abstract showing the present practice of members of the association, but aside from this the most encouraging paragraph that we find on the subject is one quoted from a correspondent of the *Engineering News* in 1888, who concluded that "in view of the difficulty of the subject the best way out is to guess at the quantities of earth to be hauled" and leave it to the contractor to make his esimates as best he may. Make no computations of the allowance for the overhaul, but say to the contractor, Here is the work, what will you do it for?

SIGNS, FENCES, CROSSINGS AND CATTLE-GUARDS.

This committee, No. 9, submits specifications for standard right of way fences, describing three classes. Galvanized wire fencing is discussed at length. The committee believes that the rapid deterioration of woven galvanized fence wire is due to the thinness and unevenness of the zinc coating. It is held that woven fence should have a second coat of zinc after it is manufactured. The committee proposes to print the report of the investigation of this subject which was made by Dr. A. S. Cushman of the United States Department of Agriculture (Farmers' Bulletin No. 239). The committee recommends that its specifications for fences be adopted as good practice and that the longitudinal wire for fences should be No. 9, with ultimate tensile strength of 1,800 lbs. to 2,200 lbs.

SIGNALLING AND INTERLOCKING.

This committee presents its seventh annual report. It recommends that, for single track, lock and block, with track circuit control, be used, and train orders (meaning, presumably, the present system of recording and repeating train orders) be abandoned. Automatic signals should be used to make intermediate blocks for following movements only. Diagrams are given of the best arrangements of block signals at stations, and the committee recommends that these diagrams be adopted as good practice. The specifications for mechanical interlocking adopted by the Railway Signal Association are printed, and the committee proposes that they be endorsed as good practice. The committee submits a code of conventional symbols and of definitions, both of which the association is asked to approve. The diagrams of automatic signal locations include representations of upwardly inclined signals. Reports are given of letter ballots on the question of the proper angle travel of semaphore arms and on the question of the upwardly inclined arm.

MASONRY.

This committee discusses failures of concrete structures, waterproofing of masonry and waterways for culverts. Many failures of concrete structures have been reported, both of plain and reinforced, due to improper design, premature or improper loading and improper materials or workmanship. The committee has considerable information, but is not yet ready to make a report. The subject of waterproofing is held over until next year. The subcommittee on waterways for culverts has not met, but the chairman has prepared an article which is to be published.

This report is supplemented by a code of specifications for stone masonry and another of definitions. The committee recommends that the specifications be adopted as good practice, and that the definitions be approved.

BUILDINGS.

The report of this committee is under three heads:

1. Relative advantages and disadvantages of circular, square or other special designs of roundhouses, and recommended general practice.

2. Smoke jacks—various designs and material, life, cost and recommended practice.

3. Roundhouse doors—descriptions and sketches of various designs and recommended practice.

Roundhouses.

Advantages of the circular roundhouse:

(a) It is the logical shape when a turntable is used.

(b) Ordinarily it is the most economical design for ground space.

(c) It requires only one "jack" per stall.

(d) The cost of handling locomotives in and out, and of turning them, is a minimum.

(e) The circular shape allows good command of the work in the house by the foreman.

(f) It gives the best facilities for furnishing natural light around the engine end of the locomotive.

(g) Artificial light can be provided at least cost.

(h) It affords better facilities for locating benches and lockers.

(i) It gives maximum room at the engine end and economizes space at the tender end of the locomotive.

(j) With equal facilities for work, and ventilation, the cubical capacity per stall in a circular house is comparatively small; consequently heating is more economical.

(k) At the expense of roofing over the turntable, the loss of heat by open doors may be reduced to a minimum.

(l) One operator and one power equipment can handle all engines going in and out.

Disadvantages:

(a) Locomotives are tied up when the turntable is out of service.

(b) Loss of heat from open doors, one outside door per stall being usually used.

(c) Difficulty in increasing the length of the stalls after they are built.

Rectangular houses are classed under two heads: through rectangular houses and transverse table houses.

The through rectangular house consists of a series of parallel tracks running lengthwise of the house with a system of lead tracks and switches at each end outside of the house and a system of double slip switch crossovers in the house, to be used in running engines around one another. The advantages and disadvantages following do not apply to the small rectangular house, open at one end only, with capacity for two to four locomotives.

Advantages of the through rectangular house:

(a) It may fit some particular location or shape of property where length but not width can be had.

(b) Provided that in case of emergency there is no confusion in operating the double slip switches and no derailment occurs at them, locomotives can be readily handled.

(c) Locomotive standing room can be increased for longer machines by changing the location of the pits and also of the crossover track system, or by increasing the length of the house and readjusting the tracks at the end.

Disadvantages:

(a) Assuming that all locomotives will enter at one end and depart at the other, it will be necessary to turn at least one-half of them before they are put into the house, and the same number again after they go out, in order to save the use of two jacks per engine stall throughout the house.

(b) Either two turntables or "Y" tracks, one at each end, will have to be used or the locomotive will have to be run from end to end outside to be turned before and after going to the house.

(c) Loss of heat from doors in opposite ends of the house being open at one time will be very great.

(d) There is no space for work benches, or for storming parts of engines temporarily, without blocking the running space for other locomotives.

(e) Locomotives cannot be required to arrive at one end and depart at the other without materially cutting down the capacity of the house by keeping several of the tracks open.

(f) If crossover clearances are maintained, and tracks are kept open for running, there will be a large amount of space in the house per effective stall, consequently the cost of heating and of lighting will be comparatively large.

The transverse table house consists of a series of parallel engine pits, usually running crosswise of the house, the locomotives being handled to and from them by means of a transverse table, located either inside or outside of the building, as determined by conditions and requirements.

Advantages of the transverse table house:

(a) The capacity of the house can be readily increased by extensions and additions of other transfer tables on the same depressed tracks.

(b) Cranes can be used to advantage if necessary.

(c) The design is favorable for use in connection with a machine shop or an erection shop, where the transfer table or tables can be used in common for both.

(d) When the transfer table is covered, heat may be saved. One door, however, will have to be opened many times instead of each of many doors occasionally. There will, in this case, be an economy in the smaller number of doors needed.

(e) Adaptability for some special locations.

Disadvantages:

(a) On account of the necessity for the use of a turntable as well as a transfer table, the cost of operation and of maintenance

will be high; the turntable will have to be used for about one-half the engines when coming in as well as when going out.

(b) Increased time for handling locomotives when the turntable work is included.

(c) The arrangement of parallel tracks in an engine house does not give the best disposition of the floor space, for when the spacing is made to suit the requirements around the engine end there will be room to spare at the tender end.

The Committee makes the following conclusions, and recommends as general principles of practice that:

The circular form of an engine house is, in general, the preferable design, with possibly the following exceptions:

(a) At branch terminals, or similar points, where not more than three or four locomotives are housed at one time and where it is more economical to provide a "Y" track than a turntable, or where it is not necessary to turn the locomotives, a through rectangular house, with switches at one end only, may be desirable, or

(b) At shops where a transfer table is used and an engine house is to be added, and at special locations, the transfer table house may be desirable.

Smoke Jacks.

The design and construction of jacks is at the present time in a state of rapid transition from the small diameter, adjustable, cast-iron form to a fixed jack of large size, with a large size flue and a damper, made of various materials. These large jacks were at first made of wood, but are now being made more and more of cast-iron, asbestos board and other non-corrosive and non-combustible materials, as fast as manufacturers are able to adjust construction to the new designs. Arguments in favor of the large fixed jacks are:

The modern large locomotive requires larger jacks to take care of the smoke, particularly from green fires.

Necessity for quick service in the roundhouse makes frequent adjustment of the location of the locomotive desirable to facilitate inspection and repairs. These movements frequently result in the separation of the stack from the jack. This difficulty is overcome by the use of the large jack.

A saving in labor is secured, as there is no work to be done in adjusting the jacks to the stacks each time a locomotive enters the house. This saving, and the general better atmospheric conditions prevailing, offset the loss of the increased draught caused by the small jacks acting as extensions of the stacks.

The life of the jacks is determined by the kind of material used, and there are no reasons why the same material cannot be used in the large as has been used in the small jacks. The cost will increase with the size, but advantages in favor of the larger size are so great that cost should not be a determining factor.

Cast-iron jacks with bottom openings 3½ to 4 ft. wide and from 10 to 12 or more ft. long, tapering gradually upward to a flue of a reasonable length, and 3½ to 4 ft. in diameter, with a damper, cost from $175 to $225 each, erected.

The Committee recommends that the engine house smoke jack should be fived, the bottom opening should be not less than 42 in. wide, and long enough to receive the smoke from the stack at its limiting positions, due to adjustment of the driving wheels to bring the side rods in proper position for repairs. The bottom of the jack should be as low as the engines served will allow, and it should be furnished with a drip trough. The slope upward should be gradual to the flue; the size of the flue for the largest locomotives should be not less than 42 in. in diameter; a damper should be provided in the flue—easily adjusted from the floor, and the material used should be non-combustible and non-corrosive.

Roundhouse Doors.

Designs of roundhouse doors include the following: Swinging, rolling, folding, lifting and sliding doors.

(a) SWINGING DOORS.—Have the advantage of being:
Comparatively cheap in first cost.
Glass can be used in them.
Small doors can be built in the larger ones.
They are, however, exposed to the wind, and liable to be blown against a locomotive and damaged.
If struck, they are liable to serious damage.

(b) ROLLING DOORS.—Are now made of wood slats or of metal.
Cost about 60 cents per square foot erected.
Small doors or glass are not placed in the large doors.
Are not exposed to damage by wind.
If struck, the damaged slats are easily repaired.
They fit snugly along the sides and at the bottom.

(c) FOLDING DOORS.—Are made of wood.
Glass and small doors can be used in them.
Are not exposed to damage by wind.
If struck, they are liable to serious damage.

(d) LIFTING DOORS.—Are made of wood.
Glass and small doors can be used in them.
Are not exposed to damage by wind.
If struck, they are liable to serious damage.

(e) SLIDING DOORS.—Do not fit tightly; the hangers rust and fail.
Glass and small doors can be used in the large ones.
One-half of the doors are necessarily closed all the time.
Are not exposed to damage by wind.
If struck, they are liable to serious damage.

The Committee recommends that roundhouse doors should be made of non-corrosive material; they should be easily operated, fit snugly, be easily reuaired and maintained, and should not be exposed to damage by wind, directly or indirectly, and should admit of the use of small doors. The particular kind of door that will suit a given case can be determined only by giving proper value to the different factors enumerated above.

The report is signed by A. R. Raymer, Chairman; E. D. B. Brown, Vice-Chairman; G. F. Bristol, M. Coburn, H. M. Cryder, B. C. Gowen, E. C. Macy and H. M. Steele.

WATER SERVICE.

Following its reports for the two years previous, which covered in detail the subject of water softening for locomotive boilers, this committee has confined itself for the past year to collecting information from railroads which have installed water softening plants. This follows in detail by roads:

Atchison, Topeka & Santa Fe.—Nearly all kinds of water are embraced in the general boiler water supply. Sixty-five plants in operation. The oldest of these has been in service for two years and six months. Capacity of plants varies from 40,000 gals. per 24 hours for the lowest, to 450,000 gals. per 24 hours for the highest. The average capacity is given as 50,000 gals. per 24 hours. The cost of softening water at these plants varies from 0.7 of a cent to 14 cents per 1,000 gals., the average cost being 3.5 cents per 1,000 gals. Among the beneficial results from the use of softened water there is reported a very decided decrease in engine failures due to boiler troubles, resulting in reduction in payrolls of boilermakers and helpers; reduction in the number of flues used; increase in time between shoppings (about 100 per cent.), and increased ton mileage of locomotives. Some of the districts where water is softened now show but from one to three engine failures per month from boiler troubles, where before softening the water they had this many failures every 24 hours.

Baltimore & Ohio.—Boiler water supply is, generally speaking, good, though in the coal and oil regions the waters contain large amounts of corrosive solids and some free sulphuric acid. Two plants in operation. One of these has a capacity of 20,000 gals., and the other 10,000 gals. per hour. These plants have been in operation about two months. The cost of softening is 0.7 of a cent per 1,000 gals., but the raw water was then in the best condition. The cost will increase in dry seasons. They report that the scale is falling off of the flues of the boilers that are using the softened water. Also they notice absence of foaming and pitting since the plants were started.

Buffalo, Rochester & Pittsburg.—There is one water-softening plant with a capacity of 600,000 gals. a day, which has been in service two years. An improvement is noticed in the condition of boilers using this water.

Central Railroad of New Jersey.—General character of the boiler water supply poor. One water-softening plant, which has been in service since Sept. 1, 1904. Capacity per day is 240,000 gals. The use of softened water in their locomotive boilers eliminates a considerable amount of incrusting solids, and improves operation of the locomotives.

Chesapeake & Ohio.—One water-softening plant in operation which has been in service one year. Capacity 5,000 gals. per hour. Cost of softening water is 4.10 cents per 1,000 gals. The use of softened water has reduced leaky flues and boiler seams to a minimum.

Chicago & Eastern Illinois.—Ten water-softening plants in operation and three in process of construction. The character of the boiler water supply is very poor. The cost of softening runs from one to three cents per 1,000 gals., with an average of two cents.: Capacity of plants varies from 10,000 gals. per hour to 25,000 gals. per hour, averaging 15,000 gals. The oldest of the plants has been in operation about two months, so that the beneficial results of using treated water are not yet demonstrated.

Chicago & North-Western.—Water supply varies from very good to very bad. Many of the waters contain a large quantity of scale-forming matter, and some of them, taken from running streams, contain mud and other matter in suspension at certain seasons. Twenty-five water-softening plants in operation, the oldest of which has been in service three and three-quarters years. Capacity of the plants varies from 120,000 to 800,000 gals. per 24 hours, the average being 300,000 gals. Cost of softening water at these plants is 0.8 of a cent for the lowest, to 3.4 cents for the highest—the average being 1.8 cents per 1,000 gals. Chemical analyses of the waters, before and after treatment, show that incrusting solids are reduced so that the quantity left in the softened water is approximately from three to five grains per gallon. Some of these waters before treatment contain approximately 40 to 50 grains per gallon of scale-making material. The officers of the Mechanical Department, who have charge of the locomotives on the divisions where the water-

softening plants are located, as well as the superintendents of these divisions, say that the use of the softened water has been of great benefit in the economical handling of trains and maintenance of locomotives. Statistics showing the cost of operation in the districts where the plants are installed indicate that they have been the direct cause of saving in the cost of repairs to locomotive boilers.

Chicago, Burlington & Quincy.—Water supply varies between wide limits. Five water-softening plants in operation, the oldest of which has been in service four years. Capacity of plants ranges from 8,000 to 30,000 gals. per hour—averaging 15,000 gals. The cost of softening is 1.2 cents per 1,000 gals. for the lowest; 2.6 cents per 1,000 gals. for the highest, an average of 1.7 cents per 1,000 gals. There has been a decrease in boiler failures on road, decrease in flue work, and some decrease in washing, due to the use of softened water.

Chicago, Milwaukee & St. Paul.—Character of the boiler water supply varies from very good to very bad. Both alkali and incrusting waters are found. One water-softening plant in operation, which has a capacity of 4,000 gals. per hour. Cost of treatment is 13.6 cents per 1,000 gals. Benefits are derived from the use of softened water, as illustrated in the case of an engine which required work on flues each week before the installation of water-softening plant. This engine was after erection of plant supplied with soft water exclusively and ran for six weeks without any work on flues.

Chicago, Rock Island & Pacific.—Character of boiler water supply variable, the solid matter dissolved in the waters ranging from 6 to 150 grains per gallon. Fifteen water-softening plants, the oldest of which has been in service 21 months. Capacity varies from 4,200 gals. per hour for the lowest, to 15,000 gals. per hour for the highest, with an average of 8,400 gals. per hour. The cost of softening varies from 3.1 to 14.9 cents per 1,000 gals., the average being 12.2 cents per 1,000 gals. The use of softened water has increased the engine miles between washings, reduced engine failures on account of leaky flues and staybolts, and materially reduced the cost of repairs to locomotives.

Chicago, St. Paul, Minneapolis & Omaha.—Water ranges from very good to very bad. Nine water-softening plants in operation, the oldest of which has been in service four years. The cost of softening water varies from 1.3 cents per 1,000 gals. to 3.9 cents, the average being 2.1 cents per 1,000 gals. There has been a decrease in repairs to boilers, and a marked improvement in the handling of trains in the district where the plants are in operation.

Delaware, Lackawanna & Western.—Five water-softening plants, the oldest of which has been in operation three years. Average capacity 286,000 gals. per 24 hours. The lowest is 240,000 gals. and the highest 350,000 gals. per 24 hours. The cost of softening is lowest, .9 of a cent; highest, 1.1 cents, average 1 cent per 1,000 gals. There has been a reduction in scale-forming matter in locomotive boilers, resulting in greater efficiency of engines, as evidenced by greater mileage for every tube reset. Previous to using treated water, boilers needed more frequent washing out, and scale-forming sediment made it necessary to repair boiler tubes often.

Detroit, Toledo & Ironton.—Water poor. Two water-softening plants in operation and one under construction. The oldest plant has been in operation nine months. Cost of softening: lowest, 1 cent; highest, 2.7 cents, with an average of 1.8 cents per 1,000 gals. Capacity of plants 100,000 and 160,000 gals. for 24 hours—averaging 130,000 gals. Considerable benefit received from less boiler work and maintenance. Locomotives using treated water give less trouble with flue and firebox leakage. Roundhouse boiler work estimated to be 50 per cent. less since the installation of water-softening plants, and 20 per cent. reduction in fuel expense.

Erie.—One water-softening plant which has been in operation for six months. The capacity of this plant is 12,000 gals. per hour.

El Paso & Southwestern System—Eastern Division.—Eight water-softening plants, the oldest of which has been in operation a little over two years. General character of water supply poor. The water from several of their wells contain 170 or more grains per gallon of incrusting solids. Capacity of plants varies from 2,000 gals. to 10,000 gals. per hour—averaging 5,000 gals. per hour. The cost for softening water on this road is 7 cents at the lowest, and 28.5 cents at the highest, with an average of 18 cents per 1,000 gals. Before the installation of water-softening plants it was almost impossible to get an engine over the division between Alamogordo and Santa Rosa without boiler trouble. Since the plants were started, the use of softened water has lessened their trouble.

Hocking Valley and Toledo & Ohio Central.—Water poor. Three water-softening plants in service, the oldest of which has been in operation three years. Plants have a capacity of from 100,000 to 650,000 gals. per 24 hours. Their cost for softening is two cents per 1,000 gals. The use of softened water results in the removal of scale-forming matter, prolongs the life of the boiler, and saves fuel.

Illinois Central.—Character of boiler water supply varies on different parts of the line. Six water-softening plants in operation. The oldest has been in operation 16 months. Each plant has a capacity of 10,000 gals. per hour. Have resulted in great reduction in cost of repairs to locomotives, as well as doing away with engine failures on account of hard water.

Lake Erie & Western.—Character of boiler water supply variable. At two of the stations where softening plants are located the waters contain about 25 grains of incrusting matter per gallon. At the other two stations the waters sometimes contain 60 grains of incrusting matter per gallon, with also a large amount of alkali part of the time. Four plants in service. One of these has been operating for 21 months, and the other three for eight months. They have a capacity of from 175,000 to 275,000 gals. per 24 hours—averaging 206,000 gals. The cost of chemicals used for softening water is 2.1 cents per 1,000 gals. for the lowest, 3 cents per 1,000 gals. for the highest, with an average of 2.5 cents per 1,000 gals. The benefits derived from the use of softened water in locomotive boilers have been removal of incrusting solids (part of which were also corrosive), large reduction in engine failures due to leaking boilers, and decreasing running repairs to boilers.

Lehigh Valley.—Four water-softening plants, the oldest in operation for two years. Capacities are: lowest, 100,000 gals. per 24 hours; highest, 300,000 gals. per 24 hours, averaging 225,000 gals. Three of the plants have been in operation for only nine months, and figures showing benefits due to the use of softened water have not yet been ascertained.

Missouri Pacific.—General character of water supply poor. Three water-softening plants in service, all of which have been in operation for nine months. The capacity of each plant is 250,000 gals. per 24 hours. The average cost of softening water on this road is 2.4 cents per 1,000 gals., ranging from 1.2 cents per 1,000 gals. for the lowest, to 4.3 cents per 1,000 gals. for the highest. The number of engine failures due to water troubles has been greatly reduced by softening the water. A master mechanic states that a saving of several hundred dollars per month has been effected through the use of softened water.

New York, Ontario & Western.—One water-softening plant in operation, which was installed in 1901. Capacity 5,000 gals. per hour. Cost averages 2.5 cents per 1,000 gals. Engines are out of service less time on account of boiler washings and flue repairs than they were before commencing to soften water; also flues last longer.

Norfolk & Western.—Water variable. On about one-half of the line the water is fair. On about one-fourth it needs filtering to remove mud and suspended matter. On about one-fourth it contains much scale-forming material. One water-softening plant in service, which has been in operation one year. Five plants in course of construction. Cost of treatment is 3 cents per 1,000 gals. Capacity of all the plants ranges from 100,000 to 250,000 gals. per 24 hours. The one plant which has been in operation for the past year has proved a great success. The water untreated contains 36 grains per gallon of incrusting solids. After treatment it contains only four grains. After 30 days' use of the treated water in a stationary boiler, no scale was deposited in it.

Pennsylvania Lines West—Southwest System.—General character of boiler water supply varies—part good and part very bad. Four water-softening plants in operation, the oldest of which has been in service for one and a half years. Cost for treatment varies from 2 cents to 3 cents per 1,000 gals., with an average of 2¼ cents per 1,000 gals. Capacity of plants varies from 10,000 to 20,000 gals. per hour—averaging 15,000 gals. per hour. The installation of these water-softening plants has done away with cracked firebox sheets; reduced number of leaky flues; made less boiler work; no trains given up on account of leaky engines; less roundhouse labor; less fuel consumed, and engines are gotten ready more quickly for trains.

Pittsburg & Lake Erie.—Water poor, containing carbonates and sulphates of lime, also at times sulphuric acid. Ten water-softening plants in operation, the oldest of which has been installed two and one-half years. Capacity is from 15,000 to 60,000 gals. per hour—averaging 25,000 gals. The cost for softening is: lowest, 0.5 of a cent; highest, 2.5 cents; average, 1 cent per 1,000 gals. Benefits derived from the use of softened water, are: increased life of fireboxes and tubes; absence of scale, collapsed tubes and corrosion; greater amount of service from locomotives, and great reduction in number of engine failures.

Rio Grande & Eagle Pass.—Character of boiler water supply poor. Two water-softening plants in operation, the oldest of which has been in service four years and seven months. Capacity of plants is 1,000 gals. per hour. As a result of the use of softened water, there has been a saving of 40 per cent. in boiler repairs, 20 per cent. in fuel, and 50 per cent. in labor and water used for washing out locomotives.

Rio Grande Western.—Three water-softening plants, the oldest in service five years. Capacity of the lowest is 50,000 gals. per 24 hours; highest, 120,000 gals., and average 70,000 gals. per 24 hours. The plants reduce the incrusting solids to three or four grains per gallon, eliminating the matter in suspension and improving the water treated.

Southern Pacific Company—Pacific System.—Boiler water supply includes both scale-forming and corrosive waters. Sixteen

water-softening plants in operation, the oldest of which has been in operation six and a half years. Capacity of plants varies from 12,500 to 175,000 gals. per 24 hours, with an average of 51,000 gals. per 24 hours. Seven more plants in course of construction. Average cost for softening water is 4.2 cents per 1,000 gals. This varies from 1.9 cents in the lowest to 6.5 cents per 1,000 gals. in the highest. Beneficial results shown in an average decrease in scale-forming matter and prevention of corrosion due to action of unstable salts naturally contained in the waters before treatment.

Texas & Pacific.—All kinds of water. One water-softening plant which has been in service eight months. Capacity 80,000 gals. per 24 hours. Cost 3 cents per 1,000 gals. Results have been beneficial, but to what extent has not yet been determined. Water at this point was so bad that it was necessary to replace the boiler used in the pumping plant every four months, but that the boiler used since plant was installed is still in use.

Union Pacific.—General character of boiler water supply is poor—carrying a considerable amount of both the carbonates and sulphates of lime and magnesia, to which is attributable hard scale. Thirty-six plants in operation, the oldest of which has been in operation four years. Capacity varies from 8,000 to 20,000 gals., averaging 11,600 gals. per hour. Cost of softening water per 1,000 gals. varies from 0.8 of a cent in the lowest, to 3.9 cents in the highest, with an average cost of 1.9 cents per 1,000 gals. Benefits derived are a very marked decrease in boiler repairs and in fuel consumption, decrease in number of boiler washings, and increase in mileage of locomotives owing to less frequent shoppings.

Wabash.—The Wabash Railroad has one softening plant, with a capacity of 175,000 gals. per 24 hours. Cost of softening water 3.1 cents per 1,000 gals.

The report is signed by G. M. Davidson, Chairman; Anthony McGill, Vice-Chairman; Geo. Crocker, C. A. Morse, R. S. Parsons, J. P. Ramsey, E. J. Randall, H. S. Waterman, M. H. Wickhorst and K. J. C. Zinck.

DISCUSSION.

Uniform Rules, Organization, Titles, Etc.—The rules submitted by the committee were taken up seriatim. Mr. Walker (N. C. & St. L.) pointed out that paragraph 11 of the rules required a report on accidents *attributable to* track, roadbed, etc. He thought the department should also report on accidents which *result in* damage to track, roadbed, structures, etc., as a broken axle, for example. The committee accepted the suggestion.

Mr. Ewing (P. & R.) called attention to the fact that under the head of "general rules" certain specific duties were outlined. He moved that the general rules contain such matter as is applicable to the heads of all departments, and the specific duties of each head of department be outlined under a separate heading. The motion was carried, as was also another declaring it to be the sense of the association that the committee is proceeding along the right lines in its formulation of rules. A suggestion that there be a separate department for water service provided for in the rules was accepted by the committee, which will take cognizance of it during the coming year.

Ties.—The committee asked the convention to take action on the conclusions. The president stated that the specifications presented year before last, and printed in the report, would, without objection, remain the sense of the association. He also called attention to the fact that the following paragraph has been inserted in the specifications: "Ties treated with a water solution, like zinc-chloride, particularly red oak and beech ties, must be piled in close piles on well-drained ground, to prevent checking."

Conclusions 1 and 2, regarding approval of the specifications and adoption of the definitions, stood as recommended. Conclusion 3, on dating nail, was likewise adopted. Mr. Wendt (P. & L. E.) stated that his road had been using copper instead of galvanized steel dating nails for several years, as the latter would not last in the industrial districts. This was due to the fact that the figures were raised instead of depressed. A depressed-figure galvanized steel nail as provided for in specifications, he thought would give satisfactory service.

Conclusion 4, on rules for tie records, was approved. No. 5, on size of standard tie, provoked some discussion. Objection being made to the recommended size, 7 in. x 8 in. x 8 ft., Mr. Curtis, of the committee, explained that it was the general consensus of opinion, as indicated by replies to a large number of inquiries, that this size was large enough. One of the roads represented was using a 6 x 8 tie, and reported it perfectly satisfactory. In the instances where the 6 x 8 tie was reported as not satisfactory, the objection was of a two-fold nature: first, that the tie was too thin for the length of spike which is now being used, and that consequently after a few years' wear the spike would go entirely through the tie; for that reason it was decided to adopt the 7 in. thickness; second, that the 6 x 8 tie was too light where the ballast was poor, or there was no ballast; a condition which has to be met, but not a condition to determine the size of the tie. Nevertheless, the size of the tie was increased to 7 x 8. The general consensus of opinion expressed in the reports was to the effect that where ballast was good, a 6 x 8 tie was ample for heavy traffic. There is a prevailing opinion that a 7 x 8 or a 7 x 9, or some other size tie, does not cost any more than a 6 x 8, but I think if you undertake to buy any great number on that basis, you will find it is a mistake. We find that is more and more true, as we are coming to sawed ties instead of hewed ties."

Asked regarding an 8 ft. 6 in. length as against 8 ft., he said there were two or three reasons recommending the latter: It is long enough for good ballast; an 8 ft. 6 in. tie must be cut from a 17-ft. log, and the logs are not cut that way. It therefore seemed wise to adopt a size according with present sawmill and lumber practice.

Mr. Bremner (C., B. & Q.) suggested that there are at least three classes of track to provide specifications for, and a size should be specified for each; also the specifications should differ for different kinds of woods. Mr. Wentworth (C., M. & St. P.) said he believed that an 8 ft. 6 in. tie equalized the bearing so as to minimize trouble from center binding. Mr. McGuigan (G. T.) referred to the difficulty of getting ties of any particular standard, many roads being glad to get ties of any acceptable size whatever. The conclusion was finally referred back to the committee to give three sizes of standard tie corresponding with the three classifications of track. Conclusion 6, asking discussion on specifications for tie treatments and referring them back to the committee for further consideration, was adopted.

Mr. Carl G. Crawford, Chief of the Section of Wood Preservation, Forest Service, U. S. Department of Agriculture, then addressed the convention with reference to the work of the Forest Service, and of his particular section. In the latter connection he said that they hoped, in the course of a year, to erect and equip a laboratory at Washington which will be a great help in research work.

Ballasting.—The committee's definition for "disintegrated granite" was approved; also its definition for "cinders," which is as follows: "Cinders—The residue from the coal used in locomotives and other furnaces." Discussion of the report pertained to the recommendation that the ballast cross-sections submitted be approved as good practice. Chairman Hanna explained in detail the reasons for adopting certain features of the cross-sections. Mr. Barnard (Penn. Lines) called attention to the fact that the association had adopted a roadbed without crown, and that therefore cross-sections of the ballast committee should harmonize therewith. This was later put in the form of a motion and adopted. In regard to crowning, Mr. Trimble (Penn. Lines) said he had for years believed in this, but he had found that although the roadbed may be nicely crowned in the original construction, examination a year or so afterward will reveal the absence of any crown, and that the ballast has been hammered into the roadbed. He also doubted the advisability of a uniform section for gravel and rock ballast.

Mr. McDonald (N. C. & St. L.) inquired about the practice of other roads in treating ballast that has become foul, having been seeking information on the point for a long time. Prof. Allen (M. I. T.) suggested, as a precautionary method against fouling, the use of fine gravel or sand on the roadbed before the ballast is put on; this being accepted practice of highway engineers for the construction of macadam roads, and is also being followed to advantage by some railroad engineers. Mr. Stevens (P. & R.) said the only way to properly get rid of the water that would otherwise remain around each tie as soon as the roadbed becomes impervious, is to provide end drainage where the ballast is banked around tie ends, by leaving an opening from the end of the tie through the ballast.

A motion to have the cross-sections applicable also to stone and slag ballast, the ones shown being only for gravel, was adopted. Also a motion to have the ballast come flush with the top of the tie in the particular cross-section, showing it 3 in. above.

Yards and Terminals.—The committee asked the adoption of the conclusions on hump yards, which was done with some slight changes, the most important being in clause (a), which stated that "a hump yard is the best form of yard, etc." This was modified to read: "A hump yard is a desirable form of yard for receiving, classifying and making up trains, because cars can be handled through it faster and at less cost than through any other form of yard." Clauses (a) and (b) were then transposed, as being more properly the order in which they should occur.

Mr. Baldwin (Ill. Cent.) thought that all freight car repair tracks should be under cover, instead of only those for heavy repairs, as recommended. This evoked some interesting discussion, in the course of which he asked if any members had ever gotten from their master mechanics a statement of time actually lost by the car repairmen in bad weather. He had, and found it amounted to a large sum of money during a season. A motion to amend the conclusion in accordance with his suggestion was lost. The conclusions about team delivery yards were adopted.

Suggestions were asked from members as to the direction of committee investigations for the coming year. A number were made, including: Methods of surface drainage; grades; poling

yards; additional data on cost of operation of hump yards; location of scales; actual data from railroads on loss of time by car repairmen due to bad weather during certain seasons; handling of switches outside of large terminals in cold weather, and in hump yards; electric lighting of yards.

Iron and Steel Structures.—The report contained a revision of last year's specifications. The chairman read the clauses which were changed, discussion being offered as he proceeded. He said that the maximum fiber strain allowed for ties in timber bridge floors had been changed from 2,400 to 2,000 lbs. per square inch. Mr. Robinson (A., T. & S. F.), of the committee, explained that he was opposed to the adoption of this figure and read a list of the sizes of ties that would be required under these conditions for different wheel loads and spacings, to indicate what it would mean in increased cost. He then gave the cost of open decks on the Santa Fe, based on 60,000 lbs. axle load, 4 in. between ties (12 ft. long ties being considered): 7 ft. centers of stringers, $2.50 per lineal foot of track; 8 ft. centers of stringers, $3.15 per foot of track; 10 ft. centers of stringers, $3.50 per foot of track. A ballasted floor of creosoted timber would cost as follows: For 8 ft. spacing of stringers, $4.20 per foot of track; for 10 ft. spacing, $6.70 per foot of track. The advantages of the ballasted floor were given in brief detail.

Some of the clauses had been changed since the report was printed and these were indicated as the reading progressed. One of these was a change in the elongation from 18 per cent. to 15 per cent. On this same clause (84) discussion arose over the figure for the phosphorus content for acid steel—0.08 per cent. Mr. Webster (Cons. Eng.) suggested reducing this to 0.06 per cent., and after similar expressions from other members the committee announced its willingness to accept the suggestion.

Mr. Condron (Cons. Eng.) moved to increase the mean ultimate tensile strength of structural steel from 60,000 lbs. to 62,000 lbs. per sq. in. Mr. Webster's amendment to refer the matter to the committee for report next year was defeated. A subsequent motion, following considerable discussion, referred the matter to the committee to report next year on the advisability of raising the limit, as suggested.

The committee's impact formula brought out lengthy discussion, relating principally to the provision of funds to enable the committee to conduct impact experiments in order to derive a satisfactory formula. The matter was finally disposed of by a motion of Mr. McDonald (N. C. & St. L.) that the committee be requested to inaugurate as soon as possible and push to an early completion an exhaustive series of experiments on the subject of impact, and to submit, as the result of such experiments, a formula for impact; and that the board of directors be requested to provide the necessary means for the experiments in such manner as they deemed advisable.

The two parts of the specifications as read to the convention were accepted.

Records, Reports and Accounts.—Conclusions 1 and 2 of the report, relating to definitions, were, in conformity with the practice of the association, not discussed. No. 3, relating to ledger accounts with individual pieces of work, was offered for discussion. The adoption of this conclusion involved the approval of two forms, M. W. 1,013 and M. W. 1,014, shown in the report. The former is an "approval of authority for expenditure." Mr. Tye pointed out the omission of provision in this blank for distribution of the expenditure to various accounts. It was suggested that separate lines be added for this purpose. Mr. L. C. Fritch (Ill. Cent.) suggested the addition of a "completion report," covering the same work as the authority blank and being the report from which the ledger account is finally closed up. Both suggestions were accepted by the committee.

The need was referred to of an estimate form to accompany the form for authority for expenditure and a motion was adopted requesting the committee to prepare such a blank or else change the "authority-for-expenditure" form to provide for both. Mr. Montzheimer (E. J. & E.) moved the addition of provision for an estimate number on the blank, which was adopted.

Mr. Hunter McDonald raised the question of the practicability of keeping a ledger account in the maintenance of way engineer's office, there being certain charges which the engineer never sees until they show up on the comptroller's accounts, such, for example, as charges through the legal department resulting from suits. The chairman of the committee admitted that this particular point had not been considered; however, he expressed his conviction that the ledger accounts could be kept satisfactorily. After further discussion as to the practicability of keeping such accounts and their value, the conclusion (No. 3) was approved.

Conclusions 4 and 5 were adopted as read and No. 6 was approved. In regard to No. 7, Mr. McDonald pointed out that its adoption as read involved the adoption of many conventional signs that had not been passed on. The committee suggested the addition of the clause "except the conventional signs, which are subject to the later action of the convention." In this form the conclusion was approved.

Classification of Track.—This was a special committee which had been asked to give a means for classifying districts of a railroad so that on portions of any road or even on the whole of some lines, lower standards of roadbed, track and other items of construction may consistently be used. The chairman of the committee, Mr. Churchill (N. & W.), explained in detail how they reached their conclusions and decided to classify on the basis of car mileage in conjunction with the actual speed of trains, after considering such points as size of locomotive, maximum axle loads, character of traffic, gross and revenue tonnage, train mileage and speed of trains.

The three classes recommended by the committee were taken up in order. Regarding Class A, it was objected by some members that the standard was too low, reference being made to the statistics accompanying the report, which showed freight car mileages per year per mile of track as high as 1,550,000. Such figures, it was asserted, called for a higher standard, since this was ten times the standard set. The committee's standard was for single-track mileage and was not high enough for lines of two or more tracks.

The chairman directed attention again to the definition, which showed Class A to include all roads having more than one main track. If a district of a railroad has enough business to require more than one track, that district is regarded as one which should adopt the highest standard of the association, Class A. The duty of the committee was to designate the lower limit—the point at which it is wise for any railroad to decide that a given district on that road shall adopt the highest standard. . . . They did not wish to rule out all single-track railroads, simply because a double, three and four-track road runs a million cars. Many of the single-track roads should be made first-class in their standards. They should adopt first-class standards throughout. Therefore the limit must be placed low enough to include districts of single-track railroads whose business is of such a character, either passenger or freight, as to warrant them in having a first-class roadbed and in adopting first-class standards. For that reason it was thought wise not to place the limit too high, and it was made 150,000 car miles. One trunk line represented on the committee has fast trains, many of them merchandise freights, and there are some districts of this road where the fast trains run in greater numbers than on other sections. That district of the road should use the highest standards. The company is working for the highest standards, and it should consistently have a reason from the committee for the latter's belief.

The committee was asked what was meant by "maximum speed of passenger trains." It was explained that the words meant the allowable speed of the district which generally appears on the time-tables, the speed for which the road is built.

Mr. Tye pointed out that up to 150,000 car miles per mile of track there were three different standards, and beyond that there was nothing else. For the lower one-tenth there were three standards, and for the upper nine-tenths nothing additional. He hardly thought a board of directors could be induced to spend the same amount of money to get a good track where there were only 150,000 car miles, as where there were 1,500,000.

Mr. Camp, of the committee, replied that 150,000 freight car miles amounts to about ten trains, figuring 50 car trains. Some locomotives can haul more than this but the average locomotive does not haul 50 cars per train; 1,500,000 car miles means 5,000 cars a day. If this number of cars a day is moved over a single track the passenger trains will have to be got rid of. Dividing this among four tracks gives a proportion of less than one-tenth, which is the proportion of 150,000 car miles and 500 cars on one track.

Mr. Porter (B. & L. E.).—The freight car mileage is fixed at 150,000 miles, and the passenger car mileage at 10,000 miles. On that basis one passenger car mile is equal to 15 freight car miles. If a road had 5,000 passenger car miles and 75,000 freight car miles, should it be in Class A? The sum of the two makes 150,000 miles.

Mr. Churchill.—Our intention is to make the 150,000 car miles solely a freight requirement. Since passenger trains run at greater speed, we thought 10,000 should be their limit. We might conceive of a condition of this kind: 140,000 freight car miles over a district and 11,000 passenger car miles. I would recommend, in a district of that kind, under the action we have suggested, that that district use the Class A standard on the basis of the passenger car mileage.

Mr. H. J. Slifer said he did not think the association could afford to say that if a section of road was handling ten trains a day it should have Class A track. He thought the freight mileage should be placed higher.

It was answered that the figure quoted would represent an average throughout the year. As the heavy business of a railroad is limited usually to a few months the number of trains during that period would be considerably in excess of ten a day. But even accepting 500 cars a day, on a basis of 40 cars per train this is 12 freights. Adding four passenger trains each way, the daily total would be 20 trains—a fairly busy piece of road.

The recommendation of the committee for Class A was finally

accepted without change, and Class C likewise. Class B was amended by adding "less than the minimum described in Class A," as the original form made it include Class A. A motion to adopt the report and publish it in the Manual of Recommended Practice was amended to refer it to the vote of the association by letter ballot.

Roadway.—The chairman of the committee asked for an expression of views and discussion on the three methods of overhaul described in clauses A, B and C, under "Abstract of Current Practice of Association Members." He called attention to the fact that the association is on record against an overhaul proposition as a part of the specifications; the present question being the submission of an alternate clause for such roads as desired to pay for overhaul.

In view of the fact that the returns to the circular of inquiry of the committee showed that out of 110 answers received, 73 allowed overhaul, and 54 of these favored method C, Prof. Allen (M. I. T.) moved that the committee be requested to bring in next year a specification in harmony with method C. But the chairman having announced that such a specification had already been prepared, and having read it to the convention, the motion was withdrawn and a substitute offered that this article on overhaul be adopted. This was amended to submit the matter to letter ballot.

The clause to be so voted on is as follows:

"No payment will be made for hauling material when the length of haul does not exceed the limit of free haul, which shall be —— feet.

"The limits of free haul shall be determined by fixing on the profile two points, one in excavation and the other in embankment, such that the distance between them equals the specified free haul limit and the included quantities of excavation and embankment balance. All haul on material beyond this free haul limit will be estimated and paid for on the basis of the following method of computation, viz.:

"All material within this limit of free haul will be eliminated from further consideration.

"The distance between the center of gravity of the remaining mass of excavation and center of gravity of the resulting embankment, less the limit of free haul as above described, shall be the length of overhaul, and the compensation to be rendered therefor will be determined by multiplying the yardage in the remaining mass as above described, by the length of the overhaul. Payment for it will be by unit of one cubic yard hauled 100 ft.

"When material is obtained from borrow pits along the embankment and runways are constructed, the haul shall be determined by the distance the team necessarily travels. The overhaul and material thus hauled shall be determined by multiplying the yardage so hauled by one-half the round distance made by the team less the free haul distance. Runways will be established by the engineer."

Signs, Fences, Crossings and Cattle-Guards.—The specifications for standard right-of-way fences were taken up, clause by clause. No. 14, providing that the [wire] fence shall be so manufactured as not to remove the galvanizing, etc., called forth the remark from Mr. McDonald that this was impossible, as the twisting of the wire breaks off the zinc. Fencing can be obtained where the wire is galvanized after the weaving is done, and the quality is much better, though the price is higher. He suggested an alternate clause, admitting both methods. No action was taken on the suggestion. The specifications covering posts were modified so as to include concrete posts.

Conclusion No. 2, regarding the tensile strength of wires, was adopted. A new conclusion was interpolated as No. 3, being the last paragraph to the section on "Galvanized Wire Fencing," reading as follows: "In conclusion, the committee believes, first, that the rapid deterioration of modern woven galvanized fence wire is caused by the coating of zinc being too thin and of an uneven thickness; second, that to procure better protection to the wire and a longer-lived fence it is necessary to secure an increased uniform thickness of the zinc coating on the wire; and to insure that the galvanizing is intact after the wire has gone through the fence-weaving machines it would seem to require that a second coat of zinc be applied to the fence after it is manufactured." Conclusion No. 4 (formerly No. 3) was adopted.

Suggestions from members for the work of the committee for the coming year included: Gates; comparative economy of metal and wood signs; different kinds of metal and other posts, extent to which used and results obtained; best kind of cattle-guard; best form of private and highway crossings.

Signaling and Interlocking.—The specifications for construction of telegraph block signal and connections were taken up first, and were adopted after being read. Action was next asked on the conclusions. Objection was made to No. 1 on the ground that it involved a transportation question rather than a maintenance-of-way question, and after some suggestions for amending it, it was finally withdrawn by the committee. Conclusions 2, 3, 4, 5 and 6 were adopted without discussion. No. 7 asked the indorsement as good practice of the standard specifications for mechanical interlocking and material for construction work adopted by the Railway Signal Association. Discussion of these specifications was requested.

Mr. Trimble (Pennsylvania Lines) objected to sections 2 and 3 relative to provision of transportation, moving to modify them to make this provision of transportation for men and material optional with the railroad company. Carried. Section 6 was likewise included.

Section 12 was modified materially, a portion being stricken out. As adopted, it reads: "Any devices furnished shall be subject to acceptance by the —————— Engineer before being placed in position." The remainder of the specifications as submitted were approved as good practice.

The portion on automatic block signals was next considered. Mr. Dunham, chairman of the committee, moved that the several arrangements of signals shown in the report be adopted as standard practice in the matter of signal locations. Carried. The conventional symbols were also approved.

Attention was asked by the committee to the diagrams of signals shown in connection with the result of letter ballot on the question of angle of travel of semaphore arm. Particular reference was made to Fig. 7, illustrating the use of an upper inclined arm. The committee considered that this type is correct in principle, and that the various types with drop arms have weaknesses which are overcome entirely when the upward-travel arm is used. On motion, the committee was instructed to examine during the coming year a signal of this sort and report next year.

Rails.—Discussion was opened by a motion to adopt the following paragraph in the report:

"There shall be sheared from the end of the blooms formed from the top of the ingots not less than 25 per cent., and if, from any cause, the steel does not then appear to be solid, the shearing shall continue until it does. If, by the use of any improvements in the process of making ingots, the defect known as piping shall be prevented, the above shearing requirements may be modified."

Mr. F. E. Abbott (Lackawanna Steel Co.), of the committee, was not in favor of the adoption of the paragraph, on the ground that manufacturers would oppose it. The object is to get rid of the piping, and the only matter of agreement will be to reach a point where sufficient shearing is done to remove the piping. If it can be removed by shearing 15 per cent., manufacturers will not agree to shear 25 per cent. Mr. Webster, chairman, said that this would simply be going back to the old requirement, which is known not to accomplish the object. Motion carried.

The committee asked for information during the year on the cause and nature of failures in 70, 75, 80, 85, 90 and 100 lb. rails. In explaining the kind of information wanted, Mr. Trimble (Pennsylvania Lines), of the committee, said: "The 85-lb. rail is by some people called a shallow-head rail; other people have a rail which has a deeper head, and the statement has been made that the American Society's rail is defective in having a shallow head. It has been stated that the head is so shallow that it fails by shearing in the track. Ws use the 85-lb., the American Society section, and I haven't seen any cases of that kind, although it has been reported to me that there have been such cases on our road. I have been told that other 85-lb. rail, with a deeper head, has been better wearing and stronger than the American Society section rail. If you will look at the 100-lb. rail of the American Society and compare it with the other 100-lb. rails, you will see there is very little difference in the depth of the head. The difference is so small I do not think you could tell it by observation in the track, either from the effect of the loads that pass over it or in any other way. In the 85-lb. rail the variation in the depth of the head is very marked, and we have the statement of the manufacturers that the 85-lb. American Society rail is a defective one. I am not sure about the other weights, but I assume that the same difference applies to the 80-lb. and the 90-lb. rails. We are asking now for definite information to compare the American Society section with other sections which have a deeper head, to find out whether we should have a deeper head or not."

A motion to adopt the A. S. C. E. specifications relating to drop tests was carried. Also another to adopt the committee's recommendations for shrinkage clause. A motion to adopt the A. S. C. E. specification for chemical composition, including a footnote recommended by the committee, reading, "Carbon may be reduced to suit local conditions," aroused considerable discussion on the question of the carbon and phosphorus contents. The motion was finally carried as originally made.

Another lengthy discussion ensued upon motion to adopt the committee's recommendation for a specification for straightening rails. This specification reads:

"Straightening.—Care must be taken in hot straightening the rails, and it must result in their being left in such a condition that they shall not vary throughout their entire length of 33 ft. more than 3 in. from a straight line in any direction when delivered to the cold straightening presses. Those which vary beyond that amount, or have short kinks, shall be classed as second quality rails and be so stamped. The distance between supports of rails in the gagging press shall not be less than 42 in."

Section II. in our specifications should also be modified to read as follows:

"Rails shall be straight in line and surface when finished—the

straightening being done while cold—smooth on head, sawed square at ends, variation to be not more than $^1/_{32}$ in., and, prior to shipment, shall have the burr occasioned by the saw cutting removed and the ends made clean. No. 1 rails shall be free from injurious defects and flaws of all kinds."

Mr. Abbot was opposed to the clause as it reads. The A. S. C. E. committee has a clause in its proposed specification making the limit of variation from a straight line 5 in. The effort of this association to reduce this to 3 in. would undoubtedly be met with strong opposition from manufacturers. In rolling rails any mill will endeavor to have them come through so that by the time they are cooled they will be nearly straight; the more nearly they are straight, the better it is for the mill and the road that buys rails. They would not fill their hot-bed with rails with a 5-in. camber. That would be against the interest of the mill. They would ordinarily try to keep down to 1 in., and make them perfectly straight, if possible; but if by mishap rails should come down that had a camber of 3¼ in., the mill would expect to straighten those rails and make them first quality rails, and they would object to a clause in the specifications which would require them to make such rails second class.

Mr. Trimble said he thought Mr. Abbot had given all the argument needed to get the 3-in. clause into the specification. Since there are only a small proportion of the rails which have a camber of 3 in. when they reach the hot-bed, the larger part do not reach anything like that figure, and rails are injured in the "gagging" process in straightening them.

There was further discussion, in which Mr. Webster explained that the 3-in. provision was inserted on the strength of information furnished the committee by Mr. E. F. Kenney, Inspecting Engineer of the Pennsylvania Railroad, who had looked very carefully into the matter of rail straightening and had requested the reduction from 5 in. to 3 in. The motion to adopt the clause as submitted was carried.

Written discussion under the heading, "Arrangement of Matter in Specifications," was invited by the committee in lieu of discussion on the floor.

Masonry.—The specifications for stone masonry were taken up, item by item. The principal discussion was on the 8th, which provides "that all stones must be laid on natural beds," etc. The question arose as to the ability always to determine the natural bed. Mr. Fritch (Illinois Central) thought that the clause should be changed to provide that all but unstratified stone should be laid on its natural bed; this to prevent the rejection of stone not laid on its natural bed where it made no difference, and thus avoid working an unnecessary hardship on the contractor.

Mr. Humphreys (U. S. Geol. Survey) said tests of large cubes of homogeneous stone showing no natural quarry bed gave quite different results under compression when the load was applied against the bed, as compared with application in the direction of the bed. He thought it important that the engineer should satisfy himself that the stone was being laid on its natural bed. Cases were cited by members illustrating the action of stone laid under different conditions and indicating the difficulty of determining the natural bed at time of laying, but no motion was made and the clause was accepted as read.

There was little discussion on the remainder of the specifications, occasional slight changes being made. A motion to adopt as a whole the classification for masonry given in the report, with such modifications as may be necessary to meet the changes made in the specifications, was carried. In final action on the report a motion was made for its acceptance, leaving it to the committee to make the necessary corrections in wording as developed by the discussion. Motion carried.

Buildings.—The report of this committee included engine houses, the advantages and disadvantages of circular and rectangular houses, smoke-jacks and engine house doors.

Conclusions as to the advantages and disadvantages of the different styles of houses were adopted.

A written discussion offered by Mr. Duncan McPherson (Nat. Trans. Ry.) criticised the arguments about the small cubical capacity and consequent economical heating of the circular house, pointing out that the item following, which advocates roofing over the turntable, is a tacit admission of the great loss of heat through open doors of this type of house. The roofing over is costly, increases the cubical capacity per stall beyond the rectangular house, and makes a difficult building to ventilate. Personal experience with a house so equipped was disagreeable in the extreme. Also no reference was made by the committee to the excessive time required to empty the circular shed in case of fire. Attempts to counteract this disadvantage have produced the expensive so-called fireproof designs. Mr. McPherson also took exception to each of the six disadvantages enumerated by the committee relative to through rectangular houses.

Under smoke-jacks, Mr. Buck (C. P. R.) called attention to the fact that the committee made no recommendation for height. Mr. Raymer, Chairman, explained that that would depend almost entirely on the construction of the house; that with the present types of large jacks the use of the jack as an extension to the locomotive stack and an aid to the draft as in the older small jacks, is lost; therefore the length is merely a matter of getting the jack through the roof. This is dependent on the building construction.

The conclusions about smoke-jacks and engine house doors were accepted.

Economics of Railway Location.—Chairman McNab reported progress. The first bulletin will be issued as early as the matter now in hand can be put into concrete form.

Track.—Action was asked on the conclusions in the report. No. 1, relative to a standard rail joint, was adopted without discussion. No. 2, relative to the appointment of a committee to confer with a committee from the American Railway Master Mechanics' Association in regard to widening gage on curves was amended to provide that the report of this committee include the action of all kinds of locomotive-driving-wheel arrangements on track, and the need for increasing the spacing between the inner pairs of drivers on locomotives having four or more pairs of drivers. Mr. Kittredge (Big Four) spoke of trouble they were having from some new engines with all-flanged drivers, especially on curves sharper than 6 degrees. The amended conclusion was accepted.

Conclusion 3 referred to maintenance of gage and inspection of track. One clause in the recommendations, relative to maintenance of gage read: "Within proper limits, a slight variation of the gage from standard is not seriously objectionable, provided the variation is uniform and constant over long distances. Under ordinary conditions it is not necessary to regage such track when the increase in gage has not amounted to more than ⅜ in." Objection was made to the clause on the ground that it tended to minimize the importance of accurate gaging. A member referred to the existence up to recently of two gages—4 ft. 9 in. and 4 ft. 8½ in., and asked how the objection would be reconciled with this condition. In answer to this, Mr. Fritch (Ill. Cent.) said that when these two gages were in use much more trouble was had from broken wheel flanges than now with only one gage, and many roads went to considerable expense to change the gage ½ in.

The clause was finally modified by omitting the first sentence and having it read: "Under ordinary conditions it is not necessary to regage track when the increase in gage has not amounted to more than ⅜ in., provided such increase is uniform." The desire was expressed by some members to reduce the ⅜ in. to ¼ in., but this was not urged.

Conclusion 4, asking the approval as good practice of the easement curve formula submitted in the report, was accepted, it being understood by members that the tables derived from the formula could be extended to take in longer curves than the figures given by the committee included.

Water Service.—Interest in the rather brief discussion of this report centered in a statement made by Prof. McGill (Canadian Inland Revenue Service), of the committee, regarding the advantages and possibilities of using barium hydrate for water treatment. The present practical objection is the cost of the reagents, but he had strong hopes of this being brought down to where it would be profitable for a railroad to use this substance on a large scale. Barium hydrate has two qualities of permanently high importance in the softening of water not possessed by carbonate of soda or lime. In the first place, the sulphates are completely thrown out of solution, and they are really the worst scaling features of a water. The second advantage is that barium hydrate renders available for actual softening of the water the lime which is present in the water; that is to say, the lime which is an objectionable quality in the water is made by a chemical reaction with barium hydrate to become valuable itself for further softening of the water. If railroads could arrive at or determine some maximum price they could afford to pay for barium hydrate it would then rest with chemists and manufacturers to try to bring down the cost to this limit. If a fixed and large demand existed it was thought that certain methods could be applied which would cheapen considerably the cost. At least two cases are known where barium hydrate might be turned out as a by-product in the course of other manufactures.

The further point was made that although by present methods the scale matter may be brought down to 4 or 5 grains per gallon, if sulphate of lime remains even to the extent of 1 grain, scale will continue to form. Therefore a slight excess of soda ash is necessary to give best results. But this excess makes trouble in its turn by increasing greatly the foaming tendency. Barium hydrate disposes of the sulphate of lime without objectionable influence on the foaming trouble.

Wooden Bridges and Trestles.—Prof. Hatt (Purdue Univ.) said that the American Society for Testing Materials has appointed a committee to draw up specifications for structural timber. This committee includes not only engineers, but consumers and producers. As timber must be used as it is found in the forest, it is necessary that specifications shall reflect the condition of supply. The present specifications are an advance, but further consideration seems necessary. He therefore moved that the specifications for bridge and trestle timbers and piling be referred back to the

committee with the instruction that they co-operate with the committee of the American Society for Testing Materials for structural timber, with a view to the preparation of joint specifications. The motion was rejected, and instead the committee's specifications, embodying some slight changes indicated by the chairman of the committee, were adopted.

Under "recommended specifications for workmanship" Mr. Cartlidge (C., B. & Q.) objected to the provision that "ties shall be notched over the stringers to a close fit," suggesting the substitution of "sized to a uniform surface," or words of like meaning, which would leave the notching optional instead of making it compulsory. Motion to this effect carried. Certain clauses were pointed out that seemed to relate to design as well as workmanship, and on motion the specifications were referred back to the committee for consideration with regard to workmanship only. The specifications for metallic details used in wooden bridges and trestles were approved.

Exhibits at the Maintenance of Way Association.

Numerically, the exhibits at the Engineering and Maintenance of Way convention were fully 50 per cent. greater this year than last, and were of unusual interest and variety. They occupied the parlor floor of the Auditorium Hotel, as usual, but it was quite evident that any further increase in their number will necessitate the provision of exhibit space elsewhere for future conventions. This will, of course, mean the changing of headquarters and place of meeting also. Just how the problem is to be met is at present only a matter of conjecture. However, its solution may be required before the next convention. The list of exhibitors follows:

Adams & Westlake Co., Chicago.—Samples of "Adlake" signal lanterns.

Affleck Concrete Steel Tie Co., Chestertown, Ind.—Models of concrete ties and frames for moulding the same.

Allis-Chalmers Co., Milaukee, Wis.—Literature describing Gates rock and ore breakers, crushing machinery, timber preserving plants, steam shovels and dredges and power and electrical machinery.

Allith Manufacturing Co., Chicago.—Full-sized door, showing application and operation of Allith adjustable door-hanger.

American Hoist & Derrick Co., St. Paul.—Photographs of American railroad ditchers.

American Iron & Steel Manufacturing Co., Lebanon, Pa.—Screw spikes and ties showing effect of spikes on ties.

American Lock Washer Co., Chicago.—Samples of double positive lock-washer.

American Locomotive Co., New York.—Photographs of locomotives.

American Signal Co., Boston, Mass.—Working model showing operation of pulsating current cab signal.

American Steel & Wire Co., Chicago.—Full-size samples of steel wire fence.

American Valve & Meter Co., Cincinnati, Ohio.—Full-sized samples of "Economy" switch-stands and model of track and switch showing operation of Anderson interlocking switch-stand.

Atlantic Equipment Co., New York.—Photographs of Atlantic steam shovels and contractors' saddle-tank locomotive.

Atlas Railway Supply Co., Chicago.—Atlas rail joints, braces and tie-plates, including the Atlas insulated and compromise joint.

Barker Mail Crane Co., Clinto, Ia.—Full-sized Barker mail crane and device for putting up pouch.

Barrett Manufacturing Co., Chicago.—Samples of Barrett roofing materials.

Battery Supplies Co., Newark, N. J.—Samples of Gladstone Lalande batteries.

Beaver Dam Malleable Iron Co., Beaver Dam, Wis.—Samples of malleable iron tie-plates and rail braces; also F. & N. anti-spreader and anti-creeper.

Belle City Malleable Iron Co., Racine, Wis.—Samples of L. & S. anti-rail-creeper; L. & S. adjustable rail brace; L. & S. stationary rail brace; also model of track showing effect of application of L. & S. anti-rail-creeper.

Bird & Son, F. W., Walpole, Mass.—"Parold" roofing, "Hydrex" waterproofing and "Neponset" insulating paper.

Bowser & Co., S. F., Ft. Wayne, Ind.—Full-sized samples Bowser self-measuring oil tanks.

Brown-Sphinx Co., Chicago.—The R. L. Brown switch-stand.

Bruley Steel Fence Post Co., Nellsville, Wis.—Samples of Bruley's steel fence post.

Bryan Manufacturing Co., Racine, Wis.—Models of "Bull Dog" grip anti-rail-creeper.

Bryant Zinc Co., Chicago.—Samples of crossing bells, batteries, relays, etc.

Bucyrus Co., South Milwaukee, Wis.—Photographs of Bucyrus steam shovels and 100-ton wrecking crane.

Buda Foundry & Manufacturing Co., Chicago.—Paulus, Buda and Wilson track drills, switch-stands, rail-benders, car replacers, ratchet and friction jacks, etc.

Buffalo Steel Co., Tonawanda, N. Y.—Samples of twisted high carbon steel bars for concrete reinforcement.

Cambria Steel Co., Johnstown, Pa.—Sample 100 per cent. rail joint and 100 per cent. insulated rail joint.

Carbolineum Wood Preserving Co., Milwaukee, Wis.—Photographs showing trestles, roundhouse floors, ties, etc., treated with avenarius carbolineum.

Carnegie Steel Co., Pittsburg.—Sample of Duquesne splice-bar and steel cross-tie.

Capitol Lock Nut & Washer Co., Columbus, Ohio.—Samples of "Capitol" lock nut and washer.

Chameleon Signal & Manufacturing Co., Edwardsville, Ill.—Working model of "Chameleon" automatic block signal.

Chicago Bridge & Iron Co., Chicago.—Photographs showing steel tanks and towers built for various railroads.

Chicago Pneumatic Tool Co., Chicago.—Samples of riveting and chipping hammers, drilling, reaming and boring machines; also sand rammer.

Chicago Steel Tape Co., Chicago.—Measuring tapes and jointed leveling rods.

Chicago Wire Fence & Tool Co., Chicago.—Heavy fence stays and tools.

Clark Publishing Co., Myron C., New York.—Sample copies of engineering books.

Climax Stock Guard Co., Chicago.—Samples and model showing "Climax" shale clay stock guard.

Conley, J. E., Arcola, Ill.—Wooden model of Conley frog.

Cook's Railway Appliance Co., Kalamazoo, Mich.—Full-sized samples of Cook's collapsible rail drill and drill grinders; also standard track jacks and Cook's combination steel and wood cattle-guard.

Cortwright Metal Roofing Co., Philadelphia, Pa.—Samples of metal roofing and model showing application.

Corrugated Bar & Expanded Metal Co., St. Louis, Mo. (formerly St. Louis Expanded Metal Fireproofing Co.).—Samples of various sizes of Johnson corrugated bars; also electrically lighted transparencies showing bridges and buildings of reinforced concrete.

Crescent Compound Manufacturing Co., Ellwood City, Pa.—Samples "Crescent" compound roofing and roofing paper and cement.

Dayton Hydraulic Machine Co., Dayton, Ohio.—The Brooks centrifugal pump in operation.

Dempsey, J. A., Chicago.—Dempsey telegraphic cipher code and model of boiler showing operation of Clark mechanical boiler cleaner.

Detroit Grapaite Manufacturing Co., Detroit, Mich.—Photographs and pamphlets describing suspension graphite paints.

Dickinson, Paul, Chicago.—Sectional models of roundhouse equipped with the Dickinson movable smoke-jack and Dickinson ventilator; also full-sized section of Dickinson smoke-jack made from "vitribestos" and full-sized section of 40-in. cast-iron jacks. Also full-sized samples of Dickinson cast-iron chimneys and ventilators.

Dixon Crucible Co., Jos., Jersey City, N. J.—Samples of Dixon silica graphite paint, and of lumber crayons.

Dressel Railway Lamp Works, New York.—Samples of signal lamps.

Eyeless Tool Co., Newark, N. J.—Samples of eyeless picks, hammers, sledges, etc.

Eastern Granite Roofing Co., New York.—Samples of perfected granite roofing and sand-surfaced roofing.

Edison Manufacturing Co., Orange, N. J.—Edison primary batteries for semaphore signals and crossing bells.

Electric Storage Battery Co., Philadelphia, Pa.—Samples of "Chloride" and "Exide" accumulators, battery cells, etc.

Fairbanks, Morse & Co., Chicago.—Full-sized Sheffield inspection car; also samples of Barrett track jacks, rail drills, stand-pipes, wheels, etc.

Frost Railway Supply Co., Detroit, Mich.—Samples of Daly spikes.

Gabriel Concrete Steel Reinforcement Co., Detroit, Mich.—Drawins illustrating Gabriel system for reinforcing concrete.

William Goldie, Jr., & Co., Bay City, Mich.—Samples of Goldie perfect tie-plug.

Goodwin Car Co., New York.—Literature describing Goodwin coal, ore and construction cars.

Gordon Battery Co., New York.—Samples of Gordon primary cells.

Graham Flange Frog Co., Salem, Va.—Model of Graham flange frog.

Gray National Telautograph Co., Chicago.—Sample of Gray "National" telautograph in operation.

Grip Nut Co., Chicago.—"Grip" nuts in various sizes.

Hall Rail Joint Co., Chicago.—Samples of the Hall rail joint for various sized rails.

Handman-Buck Manufacturing Co., St. Louis, Mo.—Circulars describing the "U. C." water cooler and full-sized sample of signal lamps.

Hayes Track Appliance Co., Geneva, N. Y.—Full-sized samples Hayes lifting and Hayes pivot derails.

Hubbard & Co., Pittsburg.—Catalogues of track tools, nuts, washers, etc.

Hussey Binns Shovel Co., Pittsburg, Pa.—Samples of shovels and scoops.

Indianapolis Switch & Frog Co., Springfied, Ohio.—Blue-prints of frog and sample of adjustable switch-rod.

Inland Steel Co., Chicago.—Samples of twisted high carbon steel bars for concrete reinforcement.

Illinois Steel Co. (Cement Department), Chicago.—Samples of material showing method of manufacture of "Universal" Portland cement and specimens of finished product.

International Creosoting & Construction Co., Galveston, Tex.—Literature describing processes of wood preserving.

H. W. Johns-Manville Co., New York.—Samples of asbestos roofing, pipe coverings and packings; also electrical devices, fuses, "Transite" board, etc.

Philop S. Justice, Philadelphia, Pa.—Samples of Justice spike-puller and "Reliance" hydraulic jacks.

Kalamazoo Railway Supply Co., Kalamazoo, Mich.—Full-sized samples hand-cars, velocipedes, track drills, jacks, gages and levels; also new wheel with reinforced tread, and Root scraper and flanger.

Kennicott Water Softener Co., Chicago.—Photographs showing installations of Kennicott water softeners on various railroads, and map showing their location.

Kettle River Quarries, Minneapolis, Minn.—Samples of creosoted wood blocks.

Keuffel & Esser Co., New York.—Sample steel tapes, transits, surveying and measuring instruments.

Kitson Portable Light Co., Philadelphia, Pa.—Full-sized samples of Kitson portable light.

Liberty Manufacturing Co., Pittsburg, Pa.—Samples of boiler tube cleaners for locomotive arch flues and twin strainers for condensing plants.

Lidgerwood Manufacturing Co., New York.—Photographs of hoisting engines, Lidgerwood rapid unloader and apparatus for coaling vessels at sea.

Link-Belt Machinery Co., Chicago.—Photographs showing coaling stations erected for various railroads.

Locomotive Appliance Co., Chicago.—Full-sized samples of Smyth derailers Nos. 1, 2 and 3; also Newton wrecking frogs.

Lord & Burnham Co., New York.—Full-sized sample of sash operating device in operation.

Lufkin Rule Co., Saginaw, Mich.—Metallic and linen tapes, steel rules, etc.

Mahoney Railroad Ditching Machine Co., Vincennes, Ind.—Working model of railroad ditching machine.

McClintock Manufacturing Co., St. Paul, Minn.—Working model of truck and locomotive showing application and operation of McClintock new cab signal.

McCord & Co., Chicago.—Model of new structural steel "Gibraltar" bumping post.

L. J. Mensch, Chicago.—Photos showing reinforced concrete coal and cinder bins, tanks, buildings, etc., erected.

McMyler Manufacturing Co., Cleveland, Ohio.—Full-sized sample of "Economy" separable switch point and Odenkirk switch-stands.

John S. Metcalf Co., Chicago.—Photos showing concrete selevators erected.

Mississippi Wire Glass Co., New York.—Samples of wire glass and figured rolled glass.

Morden Frog & Crossing Co., Chicago.—Model of track and switch showing "Security" switch-stand; samples "G. L. M." switch-stands; working model of "Universal" switch-stand; samples of adjustable open side switch sockets ;also photographs of Leighton-Hansel continuous rail crossing.

Meurer Bros. Co., Brooklyn, N. Y.—Samples of metal Spanish tile for roofing; "Anchor" ventilators; tin plate and Welsh charcoal iron plates.

Municipal Engineering & Contracting Co., Chicago.—Working model of "Chicago" improved cube concrete mixer.

National Coal Dump Car Co., Chicago.—Photographs and literature illustrating the "National" coal dump car.

National Lock Washer Co., Newark, N. J.—Samples of various sizes of "National" lock washers.

National Railway Materials Co., New York.—Samples Murray anti-rail-creepers, guard-rail braces and clamps, rail braces, etc.

National Roofing Co., Tonawanda, N. Y.—Samples of "Security" mineral asphalt roofing.

New Castle Forge & Bolt Co., New Castle, Pa.—Samples of track bolts grip nut bolts, etc.

Newman Clock Co., Chicago.—Full-sized watchman's clock and time indicator.

Otto Gas Engine Co., Philadelphia and Chicago.—Photographs showing coaling stations, water tanks and cranes, sand blast and pneumatic tool car.

Palmer-Davis Rail Joint Co., Chicago.—Samples of Palmer rail joints.

Pease-Pearson Continuous Blueprinting Co., Chicago.—Samples of continuous blue-prints made with the Franklin continuous blue-printing machine.

The Pennsylvania Steel Co., Philadelphia, Pa.—Models of "New Century" switch with adjustable stand and double crank, Manard switches; also photographs of steel bridges.

Percival Reinforced Construction Steel Tie Co., Galveston, Tex.—Samples and photos of Percival reinforced concrete tie.

Quincy, Manchester, Sargent Co., Chicago.—Samples of "Q. & C-Bonzano"

rail joint, "Elastic" self-locking steel nuts and "Q. & C." anti-rail-creeper.

The Rail Joint Co., New York.—Full-sized sample of "Continuous" insulated rail joint, "Continuous" standard, Wolhaupter standard and Weber standard, continuous, step and compromise and insulated rail joints.

Railroad Supply Co., Chicago.—Samples Wolhaupter, Q. & W. and Servis tie-plates.

Ramapo Iron Works, Niagara Falls, N. Y.—Model showing MacPherson's patent safety switch; also new Ramapo automatic switch-stand.

Reinforced Concrete Pipe Co., Jackson, Mich.—Sample of reinforcing for concrete sewer pipe; also literature descriptive of concrete sewer pipe.

Roberts & Schaefer Co., Chicago.—Photographs showing coaling stations erected for various railroads.

Robertson Manufacturing Co., Chicago.—Photographs and blue-prints showing installations of Robertson pneumatic cinder conveyor.

Rohlf & Pickford Bridge & Crossing Safety Gate Co., Chicago.—Working model of bridge and crossing safety gate.

Jos. T. Ryerson & Son, Chicago.—Samples of "Simplex" track jacks.

Safety Nut Lock Co., Minneapolis, Minn.—Samples of "Safety" nut lock.

Safety Switch Appliance Co., St. Louis, Mo.—Working model showing operation of "Safety" switch.

Scherzer Rolling Lift Bridge Co., Chicago.—Album and miscellaneous photographs showing Scherzer rolling lift bridges.

Scott Manufacturing Co., Racine, Wis.—Samples of "Racine" rail anchor and pamphlet describing the Hercules bumping post.

Sherwin-Williams Co., Cleveland, Ohio.—Literature descriptive of "Metalastic" paints.

F. A. Smith, Chicago.—Sample of curve lining gage.

Robt. C. Smith, Chicago.—Drawings and blue-prints showing Smith system of water softening and purification.

Smith Improved Lock Nut Co., Rockford, Ill.—Sample of Smith improved lock nuts.

Spencer Otis Co., Chicago.—Samples of Hart tie-plates and photographs of the "National" coal dump car; also samples of McKee rolled shoulder tie-plates.

D. P. Springer, Waverly, N. Y.—Model of Springer rail joint.

Stowell Manufacturing & Foundry Co., South Milwaukee, Wis.—Showing the Wilbern door-hanger.

Strauss Bascule & Concrete Bridge Co., Chicago.—Working model of the Strauss trunnion bascule bridge; model of ribbed reinforced concrete bridge.

Truss & Cable Fence Co., Cleveland, Ohio.—Samples of wire board fencing.

Truss Steel Tie Co., Pittsburg, Pa.—Sample sections of truss steel tie.

U. S. Wind Engine & Pump Co., Batavia, Ill.—Full-sized samples of switch-stands and semaphores and literature describing the new U. S. adjustable water columns; also water tanks.

F. P. Van Hook, Bloomington, Ill.—Sample of concrete-steel fence post.

Verona Tool Works, Pittsburg, Pa.—Samples track tools, nut locks, gages, etc.

Versailles Railway Signal Co., Pittsburg, Pa.—Samples of vulcanized fibre for rail insulation.

J. W. Walker, Pittsburg, Pa.—Full-sized sample of Ritter horizontal folding door.

Walters & Okell, Fort Madison, Iowa.—Sample of Walters ballast placing device.

H. S. Waterman, Manitowoc, Wis.—Samples of Waterman spike lock.

C. H. Whall & Co., Boston, Mass.—Samples of Whall special railroad insulating fibre.

Wm. J. Wharton, Philadelphia, Pa.—Photographs and samples showing Wharton manganese steel frogs; also switch-stands.

Jas. G. Wilson Manufacturing Co., New York—Full-sized sample of sliding swing door; also samples of rolling doors.

E. J. Winslow Co., Chicago.—Full-sized sample of "Hydrolithic" battery chute; also photographs and literature describing "Hydrolithic" battery vaults, cisterns and "Hydrolithic" waterproofing.

Investigation of Concrete Materials Under National Board on Fuels and Structural Materials.

In view of the importance of and general interest in the work which is to be carried out under the supervision of the National Board on Fuel and Structural Materials, the following statement made at the recent convention in Chicago of the American Railway Engineering and Maintenance of Way Association by Mr. R. L. Humphrey, who has the direction and supervision of the Government laboratories for the testing of structural materials, regarding what has thus far been accomplished, is reproduced:

I have heard some little criticism and comment relative to the work which was being done in the investigation of structural materials, on the ground that there has been a great deal of talk and very little action. The work was inaugurated last June under two appropriations by the Government, one for $5,000 and the other for $7,500. The first appropriation became exhausted June 30, as it was necessary to use the money in the purchase of necessary equipment, leaving $7,500 to carry on the work during the year. When I say that we have some 14 assistants at the laboratory, and that we have been examining some 77 samples of sands, gravels and crushed stones in different parts of the country, which were donated to us by the people who owned the deposits and were carried by the railroads free of charge; that the steel we used in the reinforced concrete was donated by the manufacturers, and cement was donated by cement manufacturers, you will understand the work necessary for your committee to do in co-operation with the joint committee on concrete and reinforced concrete, as well as with members of the advisory boards in getting all these assistants, and the co-operation we had. There was insufficient money, and we did the best we could. There is in preparation at the present time a bulletin which will appear before the end of this year, telling of the work which was done in that line during the past year, and also setting forth the work which has been done at various technological institutions under the work of the joint committee.

It takes a good deal of time and effort to organize. I think our organization in St. Louis, where is located the laboratory of your committee on concrete and reinforced concrete, is fairly under way. We hope to get $100,000 from the United States Government, and it seems sure that we will get it; and we hope every member interested in the work will write endorsing this work, because it is only through this interest that we will get the appropriation. We will accomplish more next year than we did this year. What I want to bring before the members of this organization is the need of the co-operation of the railroads in enabling us to get characteristic samples of deposits, sand, stone and gravel, which form the constituent parts of concrete. This is the first thing we must get information on as the basis of the final report of concrete and reinforced concrete. If the organization has to buy all this material, has to pay the freight, as well as the expenses of the inspector who goes over it, it will quickly exhaust the appropriation. So that when we appeal to you members from the various railroads to help us in this thing I trust you will understand the reasons why we are doing it, and, after the samples are furnished, to realize that it takes time before that material can be tested and a report made.

We tested some 77 samples last year. Those tests extend over a year, embracing three months, six months and a year's time, and they were made systematically and regularly; and while we have been doing a great deal of talking, as has been said, we have also been doing a great deal of work, with a limited amount of money. I hope you will have patience, and I think the coming year will show the value and extent of the work we are trying to do, and with which your sub-committee is so cordially and heartily co-operating.

Standard Locomotives for India.

The Engineering Standards Committee has issued a report supplementing that of 1903, in which five designs of locomotives were recommended as standards for the Indian State Railway. Of these, two are intended for lines of 5 ft. 6 in. gage and three for those of the metre gage. In both cases the Belpaire firebox and a boiler pressure of 180 lbs. per square inch was adopted. The reason for the adoption of the Belpaire firebox is that it gives more steam and water capacity than the usual arrangement with semi-circular outside shell and girder stays for the firebox, and with increasing pressures and larger fireboxes the length and weight of girders become excessive, and direct staying has to be resorted to.

For the engines of the 5 ft. 6 in. gage, inside cylinders were decided upon as being the type most universally adopted on the Indian railroads. With these the Stephenson link motion and balanced slide valve have been adopted, though the Walschaert gear and outside cylinders are to be used on the roads of metre gage.

Although the Calcutta Conference for Engineers expressed a preference for frames outside the wheels for the metre gage engines, inside frames have been adopted, because the difficulties anticipated in the oiling and examination of the inside frame engines have not been found to exist in the new engines sent to the Bengal & North Western, and Rohikund and Kumaon railways, and the width of the firebox is only 2 in. less than in the outside frame engine. On the other hand, the advantages gained in reduction of the width between the cylinders, the elimination of the fly crank from engines of high power, the more effective staying of the frames and reduction of weight in all parts except the boiler, which can thus be made more powerful, are of such importance that the committee, after full consideration, have adopted the inside frame, which, it may be observed, is very largely used on narrow gage lines in other countries than India.

Among the details adopted as standard are copper staybolts of 1 in. diameter spaced not more than 4 in. between centers, on the broad gage engines. The cylinders of these are to be 18½ in. diameter, with a piston stroke of 26 in., and the two are to be cast in one piece. The reversing gear is to be, preferably, of the screw type, though a steam gear may be adopted if required. The wheel centers are to be of cast steel, with balance weights cast solid, those of the passenger engines to be 5 ft. 8 in. in diameter, with 3 in. tires, making the diameter of the wheel 6 ft. 2 in. The corresponding diameters on the freight engines are to be 4 ft. 7½ in. and 5 ft. 1½ in., respectively.

The steam brake may be used on the engine and tender in combination with the automatic vacuum brake fittings on the engine, to enable the vacuum brake to be applied on the train simultaneously with engine; or the vacuum brake alone may be used.

Owing to a difference of opinion among the members of the conference as to the merits of flanged and unflanged brake shoes, there are no recommendations as to this detail.

There is to be a cab over the engine only on the broad gage engines. It is to be fitted with sliding shutters, and no cab is to be put on the tender except in the case of those roads that especially require it. Tender cabs are, however, to be used on all of the metre gage engines. The matter of the shape of the firebox is evidently to be left to the discretion of the management of the several lines, as it is merely stipulated that, "if rectangular fire holes be adopted," the sheets shall be disked out to meet the thin plate that is to be used.

In view of the practice prevailing in this country, the tubes are to be very short, that is, 11 ft. 4½ in. on the broad gage engines, and strangely enough, this is increased to 4 ft. 9½ in. on the narrow gage. The cylinder diameters of these narrow gage engines are to be 15½ in. for the passenger service, and 15 in. and 16 in. for the

light and heavy freight engines, respectively. The common stroke of all three to be 22 in. The five classes of locomotives that have thus been adopted as standards are for broad gage passenger service, 4-4-0; for broad gage freight service, 0-6-0; for narrow gage passenger service, 4-6-0; for narrow gage freight, 4-6-0 and 4-8-0.

The following is a schedule of the general dimensions of these engines:

Service	Passenger.	Freight.	Passenger.	Freight.	Freight.
Gage	5 ft. 6 in.	5 ft. 6 in.	1 meter.	1 meter.	1 meter.
Class	4-4-0	0-6-0	4-6-0	4-6-0	4-8-0
Diam., cylinders	18½ in.	18½ in.	15½ in.	15 in.	16 in.
Stroke of piston	26 "	26 "	22 "	22 "	22 "
Boiler press., sq. in.	180 lbs.	180 lbs.	180 lbs.	180 lbs.	180 lbs.
Valve gear	Stephenson.	Stephenson.	Walschaert.	Walschaert.	Walschaert.
Heating surface:					
Tubes, sq. ft.	1,229.5	1,229.5	954	954	1,164.8
Firebox, sq. ft.	120.0	120.0	108	108	126.2
Total, sq. ft.	1,349.5	1,349.5	1,062	1,062	1,291.0
Grate area	25.3	25.3	16	16	17.5
Tubes, length	11 ft. 4½ in.	11 ft. 4½ in.	11 ft. 9¼ in.	11 ft. 9¼ in.	11 ft. 9¼ in.
" number	236	236	177	177	216
" diameter	1¾ in.	1¾ in.	1¾ in.	1¾ in.	1¾ in.
W't. working order:					
Engine	51.0 tons.	48 tons.	33.7 tons.	33.3 tons.	39.5 tons.
On drivers	32.5 "	48 "	26.1 "	25.8 "	32.0 "
On tender	39.5 "	39.5 "	22.95 "	22.95 "	22.95 "
Eng. & tender	90.5 "	87.5 "	56.65 "	56.25 "	62.45 "
Wh'l base: Rigid	9 ft. 6 in.	15 ft. 6 in.	12 ft. 0 in.	12 ft. 0 in.	14 ft. 3 in.
Engine	22 " 11 "	15 " 6 "	21 " 1½"	21 " 1 "	23 " 4½"
Eng. & tender	44 " 9⅜"	38 " 4⅜"	42 " 1¾"	42 " 1¼"	44 " 10¾"
Diam. drvg whls.	6 " 2 "	5 " 1½"	4 " 9 "	4 " 0 "	3 " 7 "
Tractive power of boiler press.:					
At 75 per cent.	16,233 lbs.	19,533 lbs.	12,518 lbs.	13,922 lbs.	17,682 lbs.
At 90 per cent.	19,480 lbs.	23,440 lbs.	15,022 lbs.	16,706 lbs.	21,218 lbs.
Factor of adhesion 75% boilr press.	4.48	5.50	4.67	4.15	4.05
Tender capacity:					
Coal	7½ tons.	7½ tons.	4 tons.	4 tons.	4 tons.
Water	3,000 gals.	3,000 gals.	2,000 gals.	2,000 gals.	2,000 gals.

In this the factor of adhesion is obtained by dividing the adhesive weight by the tractive power.

While these dimensions seem small when considered in the light of the great distances and long hauls of India, as well as in comparison with what is proving so economical in this country, it must be remembered that in Mr. Priestley's recent exhaustive and valuable report on American railroads to the Indian commission, he called attention to the economies effected by the use of large cars and locomotives in the country, and at the same time expressed the opinion that Indian traffic was not yet ready for such capacities, though advising that efforts should be made toward that end.

Automatic Signals for the Union and Southern Pacific.

During the past two years the Union and Southern Pacific lines have been especially active in affording additional safeguards to traffic by extension of automatic block signaling on their principal lines. Up to December 31, 1905, 1,038 miles of track had been thus protected. Our yearly report on progress in the use of the block system, published February 2, gave the proposed new work on these lines for 1906 as 664 miles. Since that time plans have been made for further large extensions of this work during 1906, so that by the end of this year it is expected that 3,237 miles of the main lines, including all of the lines where traffic is densest, will be fully protected by automatic block signals. This includes complete protection of the entire principal main line between Omaha and San Francisco, the entire Coast Line between San Francisco and Los Angeles, and short stretches on various other parts of the roads.

The accompanying map shows the location and extent of this work, the solid lines indicating the mileage protected at the end of 1905, and the shaded portions the work projected for the current year. With the completion of this work the U. P.-S. P. lines will have by far the greatest mileage of road equipped with automatic block signals in the country, and nearly all of it single track. The estimated cost of the work to be done this year is reported to be in the neighborhood of $3,000,000.

The foregoing figures may perhaps be taken as throwing some light on the statement published in our issue of March 16, showing the remarkable amount of work now being done at the shops of the Union Switch & Signal Company; for that company furnishes, we believe, all of the material used for automatic signaling on the Union and Southern Pacific lines.

Train Accidents in the United States in February.

bc, 1st, San Pedro, Los Angeles & Salt Lake, Rowland, Cal., butting collision of passenger trains; three passengers injured.

dr, 1st, Great Northern, Towner, N. Dak., passenger train No. 3 was derailed by spreading of rails, and 14 passengers and four trainmen were injured.

bc, 3d, Cincinnati, Hamilton & Dayton, Leipsic, Ohio, butting collision of passenger trains. One engineman and two passengers were injured.

xc, 3d, night, Seaboard Air Line, White House, Fla., the engine of a freight train, backing into a side track to take out a part of its cars, collided violently with the cars, killing one and injuring five of the trainmen.

unx, 3d, Erie Railroad, Midvale, N. J., the locomotive of a freight train, which was running tender first, was derailed and fell down a bank, and the engineman was killed.

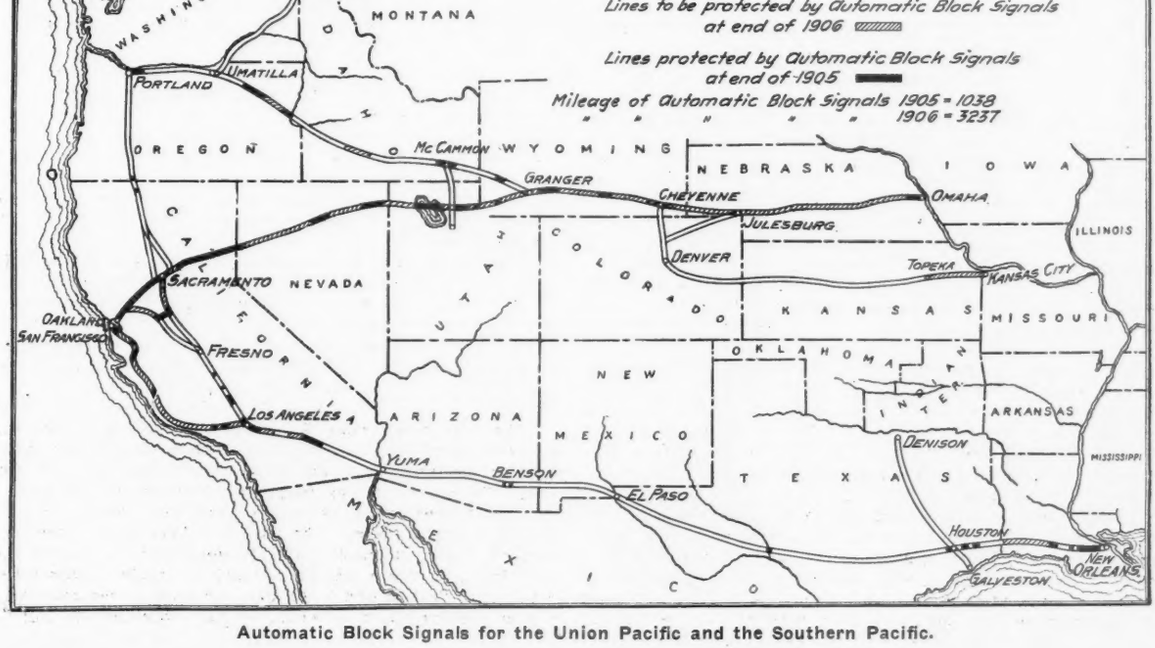
unx, 3d, Chicago, Rock Island & Pacific, Duran, N. Mex., a passenger train was derailed and the tender and seven cars were

[1]Accidents in which injuries are few or slight and the money loss is apparently small, will, as a rule, be omitted from this list. The official accident record, published by the Interstate Commerce Commission quarterly, is regularly reprinted in the *Railroad Gazette*. The classification of the accidents in the present list is indicated by the use of the following

ABBREVIATIONS.

rc	Rear collisions.
bc	Butting collisions.
xc	Miscellaneous collisions.
dr	Derailments; defects of roadway.
eq	Derailments; defects of equipment.
dn	Derailments; negligence in operating.
unf	Derailments; unforeseen obstruction.
unx	Derailments; unexplained.
o	Miscellaneous accidents.

An asterisk at the beginning of a paragraph indicates a wreck wholly or partly destroyed by fire; a dagger indicates an accident causing the death of one or more passengers.



Automatic Block Signals for the Union Pacific and the Southern Pacific.

ditched, the tender being the first to jump the track; 15 passengers were injured, two of them probably fatally.

*†xc, 5th, 11 p.m., Northern Pacific, Helena, Mont., a freight train which became uncontrollable on a steep grade collided with a passenger train, wrecking many cars in both trains. The wreck took fire and all of the passenger cars and several freight cars were burnt up. Two passengers, one trainman and one express messenger were killed and their bodies were burned up, and it is believed that two other persons, not identified, perished in the fire. One trainman was injured.

bc, 6th, Missouri Pacific, Verdon, Neb., butting collision between a passenger train and a freight, due to a misunderstanding as to the meeting point. One man was killed and several were injured.

*rc, 7th, 1 a.m., Norfolk & Western, Rippon, Va., a freight train drawn by two engines ran into the rear of a preceding freight, wrecking the caboose and several cars and overturning one of the engines. The wreck took fire and was partly burnt up. One engineman was killed and one fireman injured.

rc, 8th, 1 a.m., Central of Georgia, Forsyth, Ga., rear collision of passenger trains; five passengers injured.

unf, 8th, 3 a.m., Southern Pacific, La Moine, Cal., a freight train was derailed by a rock which fell on the track, and three cars fell down a bank. An unknown man riding on one of the cars was killed.

rc, 9th, Illinois Central, Manchester, Iowa, a freight train ran over a misplaced switch and into the rear of another freight standing on the side track; two trainmen injured, one fatally.

dr, 10th, Texas & Pacific, Odessa, Tex., eastbound passenger train No. 4 was derailed by a broken rail, and two passenger cars fell down a bank and were overturned. The conductor and two passengers were injured. The injuries of one passenger were reported as probably fatal.

xc, 11th, Baltimore & Ohio, Shenandoah Junction, W. Va., a freight train became uncontrollable on a steep descending grade and collided with a preceding freight; three trainmen injured. It is said that the runaway was caused by the engineman being asleep.

xc, 11th, 1 a.m., Southern Railway, Greensboro, N. C., a passenger train ran over a misplaced switch and collided with a yard engine. Both enginemen, one fireman and the yard conductor were killed and two other trainmen were injured.

unx, 11th, 9 p.m., Illinois Central, Chapmansboro, Tenn., a passenger train running at full speed was derailed and some of the cars were ditched. Six passengers and three trainmen were injured.

o, 12th, Louisville & Nashville, Bank Lick, Ky., the locomotive of a freight train was wrecked by the explosion of its boiler, and the engineman, fireman and one brakeman were injured, the fireman fatally.

bc, 13th, 4 p.m., Louisville & Nashville, Maurice, Ky., butting collision of passenger trains; one engineman and one fireman killed; five other trainmen injured.

bc, 13th, Southern Railway, Asheville, N. C., butting collision of freight trains due, it is said, to misreading of orders; one trainman killed, three injured. There was a dense fog at the time.

unf, 13th, 3 a.m., Southern Pacific, Shasta Springs, Cal., passenger train No. 15 was derailed by a rock which had fallen on the track, and both of the two engines drawing the train were wrecked. One engineman was injured.

bc, 14th, Chicago & North-Western, Janesville, Wis., butting collision between a passenger train and a freight; three trainmen killed and four trainmen and six passengers injured. There was a blinding snowstorm at the time.

*†xc, 14th, St. Louis & San Francisco, Columbus, Kan., passenger train No. 118 collided with some freight cars which had escaped control and run to the main track, and the engine and several cars were wrecked. The wreck took fire and the entire passenger train, except one sleeping car, was burnt up. One passenger, one express messenger and a newsboy were burnt to death, and the engineman and firman were injured.

dn, 14th, Baltimore & Ohio, Okonoke, W. Va., a freight train became uncontrollable on a steep descending grade and was derailed at a curve; engineman killed, two other trainmen injured. It is said that the engineman was asleep.

*14th, Missouri Pacific, Gasconade, Mo., westbound fast mail train No. 7 was derailed and the engine and two mail cars were ditched. The wreck took fire and the mail cars were burnt up. Four trainmen were injured.

o, 14th, Northern Pacific, Frazee, Minn., the locomotive of a freight train was wrecked by the explosion of its boiler; one brakeman killed, two other trainmen injured.

xc, 15th, 1 a.m., Pennsylvania Railroad, Lancaster, Pa., collision between a fast parcels express train and a freight train, making a bad wreck, blocking all main tracks. Both trains were westbound and the freight train, apparently in consequence of disregard of signals, attempted to pass from the four-track section to the two-track section simultaneously with the express train, and struck the cars of the latter on the sides. All of the express cars were occupied by messengers, but it is said that there were no serious injuries.

†xc, 15th, 8 p.m., Boston & Albany, Boston, Mass., a westbound passenger train passing from the two-track section to the four-track section of the line, collided with a train of empty passenger cars, and one passenger car in the passenger train was wrecked. One passenger was killed and eight were injured. The empty train, backing, appears to have disregarded a stop signal. The car in which passengers were killed and injured was a smoking car of comparatively light construction. Its position in the train was immediately behind two heavy baggage and mail cars; and behind it were heavy sleeping cars.

xc, 16th, New York Central & Hudson River, Ravena, N. Y., eastbound passenger train No. 4 ran over a misplaced switch and through a cross-over track and collided with a coal train, making a bad wreck; two passengers and two trainmen injured.

unx, 17th, Durham & Southern, Holly Springs, N. C., a locomotive was derailed at a switch and the engine was overturned. The conductor was killed and the engineman and fireman were injured.

bc, 18th, Southern Railway, Swannanoa, N. C., butting collision of passenger trains, both running at good speed; one conductor and one brakeman killed, three other trainmen injured. Misunderstanding of orders is given as the cause.

xc, 18th, Baltimore & Ohio, Ohio Pyle, Pa., a freight train broke in two and the rear portion afterward ran into the forward one, wrecking many cars. Three trainmen were injured.

19th, St. Louis, Iron Mountain & Southern, Carondelet, Mo., a fast mail train, carrying no passengers, was derailed, presumably by a broken rail; 12 men injured.

bc, 20th, Iowa Central, Eldora, Iowa, butting collision of freight trains, due to disregard of orders by the northbound train; one engineman and one brakeman killed, one fireman injured.

unf, 20th, Southern Pacific, Delta, Cal., a passenger train drawn by two engines was derailed by a landslide. The engines were wrecked and two mail cars fell down a bank. After the derailment a second landslide occurred, killing one of the enginemen.

unx, 20th, Mobile & Ohio, Marion, Miss., a freight train was derailed and an engine and nine cars were wrecked. The engine was overturned and the fireman killed.

rc, 21st, Lake Shore & Michigan Southern, Amasa, Pa., rear collision of freight trains; one conductor killed, one trainman injured.

rc, 21st, Southern Railway, Chatham, Va., rear collision of freight trains, derailing and overturning one engine and five cars; four trainmen injured.

unx, 21st, Louisville & Nashville, Nortonville, Ky., a freight train was derailed and the engine was overturned; engineman killed, several other trainmen injured.

xc, 22d, Pittsburg, Cincinnati, Chicago & St. Louis, Carnegie, Pa., collision between a through freight train and a yard train, wrecking eight cars; two trainmen killed, eight injured.

dn, 23d, 2 a.m., Central of Georgia, Matthews, Ala., freight train No. 38 was derailed by a misplaced switch; three trainmen injured.

eq, 24th, Toledo, Peoria & Western, Crescent City, Ill., a westbound passenger train was derailed by the breaking of the flange of a wheel of the tender, and the engine and first two cars were ditched. The engineman was killed and 20 passengers were slightly injured.

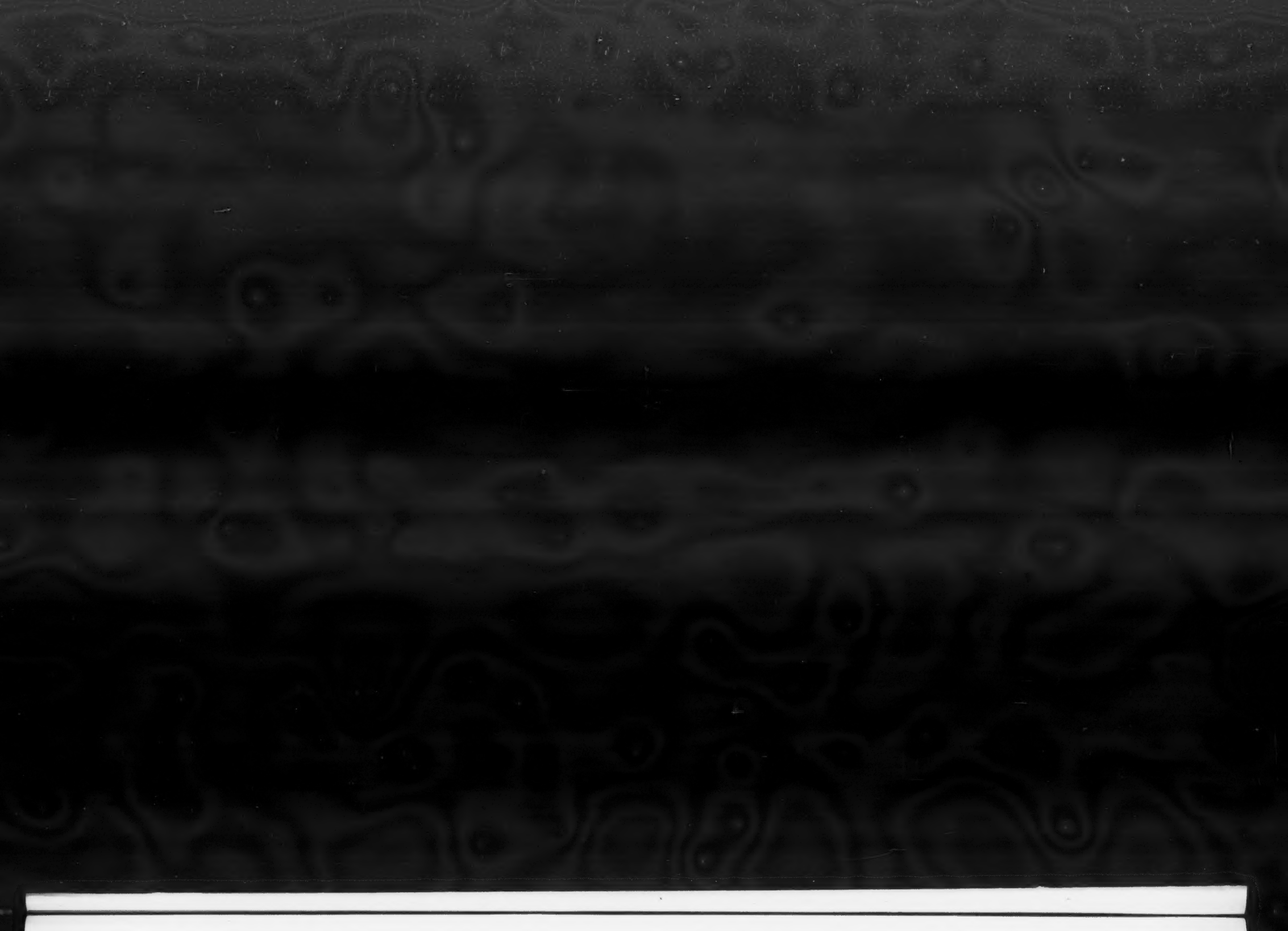
bc, 25th, St. Louis, Iron Mountain & Southern, Diaz, Ark., butting collision of freight trains, wrecking both engines and six cars; two trainmen injured.

bc, 25th, New Orleans & Northeastern, Enterprise, Miss., butting collision of passenger trains, making bad wreck. One engineman was killed and 12 passengers and trainmen were injured. It appears that one of the trains should have waited for the passage of four trains in the opposite direction, but started out after the passage of the third.

bc, 26th, Delaware, Lackawanna & Western, East Buffalo, N. Y., butting collision of switching engines; employee killed.

unx, 28th, Coal & Coke, Elkhurst, W. Va., a passenger train was derailed and the locomotive and two cars fell down a bank, one of them turning over twice. Some of the passengers were thrown into Elk river; 13 passengers, a mail clerk and three trainmen injured.

The Hungarian State Railroads have had to defend suits for non-delivery of freight within the time prescribed by law during or after the great railroad strike which disabled them for some time. Their defence was that such delivery was rendered impossible by "higher power," which in their law is about what is called "act of God" in ours. The courts upheld their claim and pronounced that a railroad strike, at least such an one as they suffered from, is "*force majeure*," which certainly sounds better than to call it an "act of God." At least there have been railroad strikes in this country which it would be flat blasphemy to call "acts of God."



GENERAL NEWS SECTION

NOTES.

The bill which was before the legislature of Iowa to reduce all passenger fares in the state to two cents a mile has been defeated.

The Pere Marquette Railroad has issued an order to its agents to confiscate for its own use all of the coal mined in the Saginaw Valley between March 21 and April 1.

The legislature of New Jersey has passed the Perkins bill for the equalization of taxes, which, it is said, will increase the amounts to be paid by the railroads of the state by about $3,000,000 a year.

It is announced in Canada that the Canadian Pacific is making out a new price list for its western lands, and hereafter will sell none at less than $10 an acre. The company still holds 10,900,000 acres in Manitoba.

Reports from Pittsburg, Chicago, Indianapolis and other cities report that all railroads are stocking their coal piles as rapidly as possible, with a view to being prepared for a strike of miners, and many of the roads evidently are confiscating coal which is in transit.

A press despatch from Casper, Wyo., reports a wreck of a work train on the Chicago & North-Western near Natrona, Wyo., March 25, in which 10 employees, mostly laborers, were killed and 15 were injured. The train broke through a bridge which it was crossing at low speed while the track was submerged by a flood.

A press despatch from Albuquerque, N. Mex., says that the Caledonian Coal Co.'s suit against the Atchison, Topeka & Santa Fe, and others, for $600,000 damages, has been compromised and will be dismissed. It appears that the developed mines of the Caledonian company are to be bought by the railroad and its allied coal companies.

According to a press despatch from Durango, Col., of March 22, a passenger train carrying 50 passengers was stuck in the snow at Cumbress Pass in the mountains for 12 days. Provisions had to be carried to the train by men wearing snowshoes, and some of the passengers were made sick by their long stay in the rarefied atmosphere of that high altitude.

The "ladies' smoking car," referred to in a press despatch from London last week as being in service on one of the roads between London and Liverpool, proves to be a "fake." The story appears to have had for its basis the engagement of a car, for a single trip, by a party in which were three women who had a carriage or compartment reserved for themselves for smoking.

As a result of the investigation following the collision at Baker Bridge, Mass., last November, the Boston & Maine has put in use a fusee which is a combination of a stop and a caution signal. The fusee burns red for three minutes and then yellow for five minutes. For use on long descending grades a 10 minute fusee has been made. This burns red five minutes and yellow five minutes.

Passenger trainmen on the Monongahela division of the Pennsylvania have had their wages raised about 10 per cent., the new scale being as follows: On all trains making more than 113 miles a day—Conductor, $4.29; baggage master, $2.53; brakeman, $2.03; engineman, $4.73, and fireman, $2.69. On all trains making 113 miles a day or less—Conductor, $4.01; brakeman, $1.92; engineman, $4.40, and fireman, $2.25.

In New York City last week a street car conductor was sentenced to prison for 10 years for causing the death of the driver of a mail wagon. The accident occurred at 3 o'clock in the morning, when the conductor had temporarily taken the place of the motorman who had gone inside of the car to talk with a woman passenger. The conductor lost control of the car and ran it into the mail wagon. The railway company paid $20,000 to the family of the man who was killed.

According to a Pittsburg paper, 50 female car-cleaners in that city who, the other day, failed to secure an interview with the superintendent of their division, went to his house in a body, about 9 o'clock in the evening, and stormed his library, so to speak; that is to say, they brushed aside the butler, who was not going to admit them, and went in and hunted up their man. The spokeswoman had uttered only three words before the other 49 strikers joined in the address, or appeal. Then, says the reporter, the superintendent threw up his hands. After telephoning to his assistant to hear the women's complaint the next day, he succeeded in calming the strikers, so that they left.

In New York City last week the Interstate Commerce Commission took evidence concerning wrong and presumably fraudulent classifications of freight by shippers. Inspectors for the Trunk Line Association testified that 34,000 false classifications had been found at New York in a single month. There are 49 inspectors. One of the inspectors said that the number of frauds which escaped them was probably larger than the number detected. In the month of January corrections were made on 14,060 local shipments and on 10,486 through shipments. The increased revenue secured by these corrections was $16,000 on reclassification and $1,000 on increased weight. Drugs had been described as salt and fertilizer, and an expensive chemical as ginger ale. Artificial flowers were billed as millinery, and human hair as horse hair. Some shippers tried to fool the inspectors by putting higher priced goods in the bottoms of the boxes. The witnesses gave the names of a number of shippers who, they said, were persistent in their offenses. Two of these are, we regret to say, within a stone's throw of the office of the *Railroad Gazette*. On the second day of the hearing, testimony was taken from shippers and shippers' agents alleging that the wrong classifications were due to the mistakes of packers and to difficulty in classifying a mixed lot of goods. One shipper who always billed looking glasses as plate glass said that several years ago the railroads supplied him with rubber stamps reading "plate glass" and he had continued to use them. One witness, telling how manufacturers had to practice deception to meet competition, said that goods made in Massachusetts had to be labeled "Made in Germany."

D. & H. Gasoline-Electric Motor Car.

The General Electric Company's new gasoline-electric motor car for the Delaware & Hudson was tried on Tuesday of this week in three round trips between Schenectady and Saratoga. It was shown and described in this paper February 9, and the trials have fully met the expectations of the designers, but in one respect, the use of cheap kerosene instead of the more costly gasoline, has not been found to be feasible. The car will be run experimentally in the Schenectady-Saratoga service, and it seems likely to solve the problem of working stub-end branches of steam roads until sufficient traffic warrants an electrical equipment. It is operated from either end, obviating the necessity for turntables or switching arrangements to accomplish the same purpose, and the efficiency and flexibility of the electrical features, combined with the fact that this part of the equipment is tried and proven, seems to indicate its superiority over any gasoline outfit with mechanical drive. It has also a better tractive effort secured by the electric motors on both trucks, a feature not possible through the mechanical drive.

With improved engine design and a complete equipment brought down considerably in weight, there seems to be no good reason why such a car should not be useful.

Armour Refrigerator Cars.

Mr. J. Ogden Armour, who has not yet finished his defense of the packers, returns, in the last issue of the *Saturday Evening Post*, so his argument presented in his opening article, that conservative fruit dealers are satisfied with the Armour management of refrigerator cars. The actual growers and shippers of fruit, he says, have never voiced a serious complpaint against the car lines and do not now favor the agitation against the private car companies. He quotes from speeches made and resolutions passed by fruit jobbers, who have complained among themselves how they have advanced the price of fruit (for example, strawberries in Arkansas) by sending too many buyers down there to compete. Last season there were at Van Buren the first week "ten buyers for each car" of berries, and the local shippers took advantage of the situation to "boost the prices out of sight," making from $300 to $500 a car extra profit. This, says Mr. Armour, goes to prove his statement that the Armour lines have been a great benefit to the fruit grower by sending competing buyers to his door. A Chicago fruit merchant, F. Newhall, says that while the private cars make high charges for refrigeration, their service is cheaper in the end because of the uniformly good condition of the fruit at destination.

Troubles of the Relief Department.

According to despatches sent out from several cities, the pensioning of employees of the Pennsylvania Lines west of Pittsburg may be discontinued. Threats to this effect have been made repeatedly of late, it is said, by agents of the Pennsylvania Company. The threat is being made, it is explained, in an effort to get signatures to a gigantic petition against a bill in the Ohio Legislature aimed against rules of the volunteer department of the Pennsylvania Lines. The alternative given the employees is to sign or to see both pension and relief systems abolished.

The bill which is causing the trouble has already passed the Ohio State Senate, and will come up before the House within a few days. It provides that railroad employees shall not be allowed to

surrender their right to damages for injury received on the road which employs them.

When an employee becomes a member of the relief association he is required to sign an agreement by which he waives all rights to damages for himself or family in case of accident or death on the road. This is regarded by employees as an obnoxious feature. It is not compulsory that they join the organization, but new employees receive a gentle intimation that it is expedient to join. Some sign the release-from-damages agreement under protest. Others do not realize the real force of the agreement and attach their signature without a murmur.

Abolition of the relief department, into which many of the old employees have been paying dues for fifteen years or more, and which entitles them to small weekly payments during disablement, and a life insurance policy, payable to their families, would go hard with the older employees. Abolition of the pension system would be an even greater blow to the older employees.

It is thought by many that the threat of the company's agents, who have already obtained the names of 5,000 employees to the petition against the Ohio bill, is merely a "bluff." These say that the railroad would not dare abolish its pension and relief systems, because of the ill feeling that would be engendered among its thousands of employees.—*Indianapolis News.*

The Railroad Problem, Condensed.

Chairman Knapp,. of the Interstate Commerce Commission, in an address before a club at Washington recently, expressed the opinion that the national conscience is awakening. He says the pass evil is becoming recognized as a great evil, and from being a badge of distinction, is now recognized, if not as a mark of infamy, at least as a distinction of a sinister sort. Chairman Knapp went over the whole railroad situation. The governments of foreign countries control the railroads directly. This country had never come to look with favor on government ownership, but it is now vitally interested in government supervision of rates. The railroad is of essential use to the community and should be open on equal terms to every one. The total valuation of railroad property in the United States has reached the enormous figure of $11,250,000,000.

These roads may be divided into eight great groups—the Hill, Harriman, Vanderbilt, Atchison, Pennsylvania, Atlantic Coast, Southern and Rock Island. These included fully 70 per cent. of the roads and three-quarters of the traffic and the receipts. The men who are at the head of the railroads are also at the head of the oil, steel and other great industries. All these interests have a common center in New York, and the problem that is before the people is in reality far deeper than the mere regulation of rates. It is the control of wealth itself, and the problem of whether the country should be governed from Washington or Wall street. . . . Publicity will do much to correct any evils complained of. There should be a sworn statement each year of traffic, earnings and expenses. Giving of rebates should be made a criminal misdemeanor. The rates should be made by such body as shall be designated by Congress. But the question of whether such regulation should be of a legislative or judicial character was a matter yet to be determined.

Destruction of the Steamer Plymouth.

The side-wheel steamer Plymouth of the Fall River Line was burned to the water at the wharf of the company's repair shops at Newport, R. I., on the morning of March 27, and the freight steamer City of Lowell was badly damaged. Damage to the sheds and to other steamers brought the total loss up to $1,000,000. One fireman was burned to death on the Plymouth. The cause of the fire is unknown.

Japan to Buy Railroads.

A press dispatch from Tokio, March 27, says that the bill for the nationalization of railroads as amended by the House of Peers, was again presented in the House of Representatives and, after strong opposition, was adopted. The amendments, however, do not change the compulsory nature of the bill. The period for the whole transaction is changed from five years to ten years. The companies to be bought are reduced from thirty-two to seventeen, cutting down the total amount to be expended from $235,000,000 to $220,500,000. The time for delivery of the bonds representing the price of each railroad is extended from two years to five years, and means are provided for protest being made against the official price.

The Cincinnati Rebate.

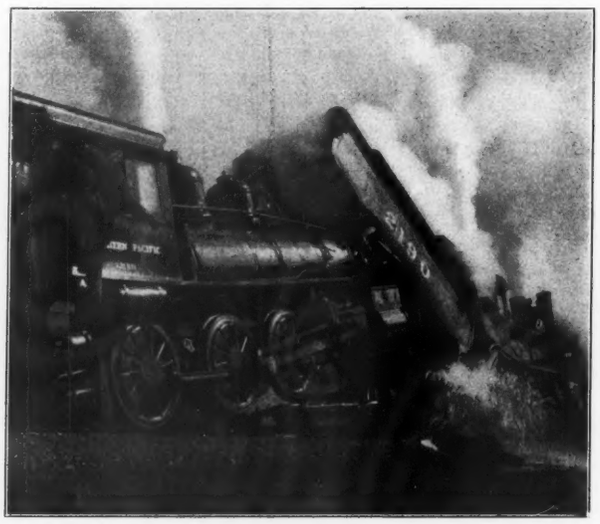
Following the charges against the trunk lines of unlawful discriminations in favor of the sugar trust, come these frank admissions by traffic officials of the "Big Four" system, of paying money rebates to favored steel and coal corporations, and of maintaining a special list of shippers who were permitted to ship goods at their own statement of weight. And this right in the face of repeated announcements that the roads are now observing the anti-rebate law. As a matter of fact, are they making any effort to observe the law, and do they care a rush about the law, anyway? If these particular traffic officials were led into the practice by the lawlessness of other roads, why did they not expose and seek the punishment of the other roads? But it does not appear that they were influenced by any other power than a force of habit, obtaining among American roads, of specially favoring a selected class and making the unfavored many bear the burden. And then they come forward and confess their lawlessness only when promised immunity from prosecution. Such disclosures as these will not help the roads in their present campaign for a let-alone policy on the part of the government.—*Springfield Republican.*

Two Famous Engines.

After several endeavors to put them to more practical use, the North Star and the Lord of the Isles, perhaps the two most renowned locomotives in England, have been consigned to the scrap heap of the Great Western Railway at Swindon. Both engines are survivals of the old broad-gage system, and the Lord of the Isles, as such, has been exhibited in all parts of the world. It was one of 30 engines designed in 1842 by the late Sir Daniel Gooch, and drew the last train of broad-gage vehicles which left Paddington station prior to the abolition of the system in 1892.

A Tragedy—Taken from Life.

The accompanying cut does not represent a show collision; it is a halftone from a snapshot which Mr. B. W. Stevens, of Pinole, Cal., happened to be able to catch the other day of an actual accident, a butting collision of a double-header going in one direction



Courtesy of New York Tribune.

Snapshot of a Collision.

with a train drawn by one engine in the other direction. (At least, there is only one opposing engine visible.) The engineman and fireman are just in the act of dropping off. One of these men was killed. The spray at the right of the picture is water from a rupture in the tilted tender.

Land Grants to Projected Railroads in the Province of Quebec.

The Quebec legislature at its present session has made land grants of 4,000 acres a mile to the following railroad corporations: Atlantic, Quebec & Western, for building 150 miles of road; Matane & Gaspe, for 30 miles; Quebec & Lake St. John, for 12 miles; Quebec Central, for 9 miles (in lieu of cash subsidy); Joliette & Lake Manuan Colonization Railroad, for 60 miles; Interprovincial & James Bay, for 50 miles; Pontiac & Inter-Provincial, for 30 miles; also for lines from Herbertville to St. Joseph d'Alma, on the Saguenay, 10 miles; Roberval toward James Bay, 30 miles, and Jonquieres toward Ha Ha Bay, 30 miles. A grant of 3,000 acres a mile was also voted to the Northern Colonization Railroad for 32 miles of projected road and grants of 2,000 acres a mile to the St. Maurice Valley, for 30 miles; Great Northern of Canada, for 85 miles; Lotbiniere & Megantic, for 30 miles, and Orford Mountain, for five miles. All mines and minerals on these lands are reserved for the Crown. The choice of lands is to lie with the Lieutenant-Governor of the Province.

Manufacturing and Business.

The Tacoma Eastern Railroad has ordered 50 sets of Bettendorf trucks and bolsters for 35-ton cars.

F. W. Bird & Son, East Walpole, Mass., have opened a new department known as the Hydrex Felt & Engineering Co., in charge of Edward W. DeKnight, with headquarters at 120 Liberty street, New York.

The name of the St. Louis Expanded Metal Fireproofing Co.,

St. Louis, Mo., has been changed to Expanded Metal & Corrugated Bar Co., and the offices have been moved from the Century Building to the Frisco Building.

The Vacuum Cleaner Co., 427 Fifth avenue, New York City, has made a contract with the Louisville & Nashville to build a plant, adjoining the station of that road in Louisville, Ky., for cleaning the interior of the office building as well as the passenger cars at the terminal.

The general offices of the Republic Iron & Steel Co. have been removed to the Frick Building Annex, Pittsburg, Pa., to which all general office correspondence should be addressed. The present district sales offices will be maintained, including a Chicago sales office, located in the First National Bank Building.

The Watters A. B. C. pneumatic sander, made by J. H. Watters, Augusta, Ga.—E. G. Fisher, Chicago, general western agent—has been specified for 100 new locomotives recently ordered by the Southern Railway from the Baldwin Locomotive Works; also for a number of new locomotives for the Chicago Junction Railway.

The Solid Steel Tool & Forge Co., Brackenridge, Allegheny County, Pa., makers of drop forgings, car forgings, track tools, etc., announces that the company will be taken out of the hands of the receiver, James D. Wilson, as soon as the necessary formalities can be gone through. James H. Baker, who has been managing the Sales Department of the company for the receiver, will become a member of the new board of directors and take an active part in the management of the company's affairs.

Compressed Air announces that with its issue of May it will appear in enlarged form and under new management. Hereafter it will be published by The Kobbe Co., 90-92 West Broadway, New York. A special feature of the paper will be a department devoted to correspondence, a discussion of which will be encouraged among its readers. But probably the most valuable information will be contained under the heading, "Practical Items for Practical Men," where data of direct and practical value to compressed air users will be discussed. Mr. W. L. Saunders will remain as editor-in-chief, W. R. Hulbert will be managing editor, and P. F. Kobbe, Jr., will be business manager.

Iron and Steel.

Orders for rails continue active. The Chicago, Milwaukee & St. Paul has given an order to the Illinois Steel Co. for 125,000 tons of rails, most of which is to be used on its Pacific coast line. The Brookville & Mahoning Valley has given its first order for rails—5,000 tons—to the Carnegie Steel Co., and will probably buy more during the present year. Seventeen thousand tons have been ordered from the same company for delivery this summer by the Lake Erie & Michigan Southern, and the Great Northern has given an order for 20,000 tons. The Northern Pacific has given an order for 30,000 tons to the Lackawanna Steel Co., and the Delaware & Hudson 15,000 tons to the Pennsylvania Steel Co. Inquiries are being made for about 150,000 tons additional for foreign orders.

OBITUARY NOTICES.

Robert Miller, at one time General Superintendent and later Superintendent of Motive Power and Equipment of the Michigan Central, died in Detroit, Mich., March 13. At the time of his death he had been retired from railroad service for several years. Mr. Miller was a typical example of the western railroad man who by his own unaided efforts and native ability works himself up from a humble position in the ranks to a high official position on an important road. Born in Ithaca, N. Y., in 1840, he entered railroad service at the age of 19 as a machinist in the shops of the Chicago, Burlington & Quincy. He served in the army throughout the Civil War. At the close of the war he returned to the Burlington as foreman of the erecting shop. In 1876 he went to the Michigan Central as Master Car Builder, being also in charge of buildings and waterworks. In 1884 he was made Assistant General Superintendent and six years later became General Superintendent. In 1896 he became head of the motive power department with the title of Superintendent of Motive Power and Equipment. He continued in this position until 1900, retiring at the age of 60 years.

Robert Miller.

MEETINGS AND ANNOUNCEMENTS.

(For dates of conventions and regular meetings of railroad conventions and engineering societies, see advertising page 24.)

National Association of Railway Commissioners.

The annual meeting of this association is to be held in Washington, D. C., beginning April 2. The call for the meeting contains the usual list of subjects.

Canadian Society of Civil Engineers.

At a meeting of the Mechanical Section held March 29 the following papers were read: "Notes on the Shops and Power House of the Canada Car Co.," by E. G. M. Cape; "Durability of Wire Rope Under Severe Conditions," by T. H. Schwitzer. The papers were illustrated by lantern slides.

ELECTIONS AND APPOINTMENTS.

Executive, Financial and Legal Officers.

Atlantic & Birmingham.—The offices of the Vice-President and General Manager, the Auditor and the General Freight and Passenger Agent have been removed from Waycross, Ga., to Atlanta, Ga.

Chicago & North-Western.—R. H. Williams, Assistant Treasurer and Second Assistant Secretary, has been appointed Treasurer and Assistant Secretary, succeeding S. O. Howe, deceased. M. B. Van Zandt succeeds Mr. Williams.

New York Central & Hudson River.—J. L. Ferris, Chief Clerk to the Auditor of Passenger Accounts, has been appointed Auditor of Passenger Accounts, succeeding J. F. Fairlamb, promoted.

Philadelphia & Reading.—C. E. Henderson, Second Vice-President, has resigned as First Vice-President of the Philadelphia & Reading Coal & Iron Co., but he remains in charge of the Traffic Department of the railroad.

St. Louis, Iron Mountain & Southern.—T. T. Eckert has been elected a member of the Executive Committee, succeeding Russell Sage, resigned. Mr. Sage remains on the Board of Directors.

Operating Officers.

Chicago, Burlington & Quincy.—O. E. Stewart, Superintendent at Ottumwa, Iowa, has been appointed Superintendent at Burlington, Iowa, succeeding W. G. Sharretts, resigned. L. B. Allen, formerly Superintendent of the Chicago, Rock Island & Pacific at Rock Island, Ill., succeeds Mr. Stewart.

A. T. Perkins, Superintendent at St. Joseph, Mo., has resigned to become adviser to the St. Louis Municipal Bridge & Terminal Commission.

Coal & Coke.—F. M. Fisher, Trainmaster, has been appointed Superintendent.

Denver & Rio Grande.—The authority of A. E. Welby, General Superintendent of the Rio Grande Western, has been extended over the D. & R. G., succeeding H. T. Herr, resigned.

Louisiana & Arkansas.—W. T. Tyler, formerly General Superintendent of the St. Louis, Iron Mountain & Southern, has been appointed General Manager of the L. & A., with office at Texarkana, Ark.

New York Central & Hudson River.—F. E. Williamson has been appointed Car Accountant, effective April 2, 1906. Mr. Williamson graduated from the Academic Department of Yale University in 1898, and entered railroad service the next fall as a clerk in the office of the Superintendent of the Mohawk division of the New York Central. The next year he was appointed division claim agent, and after a year and a half was made agent at Rome, N. Y. He was later transferred to Utica and then to Troy, N. Y. In 1903 he was appointed Chief Clerk in the office of the Car Accountant, at New York, where he has remained until his present promotion.

Rio Grande Western.—See Denver & Rio Grande.

Trinity & Brazos Valley.—P. A. Gorman, General Superintendent, has resigned.

Traffic Officers.

Cumberland Valley.—J. L. Eysmans has been appointed General Freight Agent, with office at Harrisburg, Pa., succeeding H. C. Clevenger, resigned.

Galveston, Harrisburg & San Antonio.—See Texas & New Orleans.

St. Louis & San Francisco.—John Sebastian, Passenger Traffic Manager of the Chicago, Rock Island & Pacific, whose authority was recently extended over the St. Louis & San Francisco and the Chicago & Eastern Illinois, entered railroad service as a clerk on the Atchison, Topeka & Santa Fe in 1869, becoming later Chief Clerk and then Traveling Passenger Agent. In 1880 he went to the Chicago, Rock Island & Pacific as general southwestern passenger agent. Seven years later he was made General Passenger and Ticket Agent of the Chicago, Kansas & Nebraska, remaining there two years, until the company was made a part of the C., R. I. & P. He then was made General Passenger Agent of the Rock Island, and was appointed Passenger Traffic Manager in 1902. In 1903 his authority was extended over the Choctaw, Oklahoma & Gulf, the St. Louis, Kansas City & Colorado, and the Chicago, Rock Island & El Paso.

John Sebastian.

Texas & New Orleans.—Joseph Hellen, Assistant General Passenger Agent of this road and of the Galveston, Harrisburg & San Antonio, has been appointed General Passenger and Ticket Agent of the T. & N. O., with office at Houston, Tex., succeeding T. J. Anderson, resigned.

Engineering and Rolling Stock Officers.

Canadian Pacific.—A. L. Hertzberg, Engineer of the Ontario division, has been appointed Engineer of Maintenance of Way, succeeding F. P. Gutelius, promoted. J. M. R. Fairbairn, Engineer of the Eastern division, succeeds Mr. Hertzberg, with office at Toronto, Ont. J. H. Barber, Engineer of the Atlantic division, succeeds Mr. Fairbairn.

Denver, Enid & Gulf.—J. F. Carey has been appointed Chief Engineer, with office at Enid, Okla. T., succeeding J. B. Dalton, resigned.

Erie.—D. H. Wilson, Jr., has been appointed Electrical Engineer.

Louisville & Nashville.—J. O. Ely has been appointed Assistant Engineer at Knoxville, Tenn., succeeding E. L. Cruger, resigned.

Pennsylvania.—E. B. Temple, who was recently appointed Assistant Chief Engineer, was born in 1871 and graduated from the Engineering Department of Swarthmore College in 1891. He immediately began railroad work in the Construction Department of the Pennsylvania, being engaged in the surveying corps, and later on inspection of construction work. In 1897 he was transferred to the Drafting Department and was later appointed Assistant Engineer in that department. He took entire charge of the department in 1901, and on Jan. 1, 1905, was made Assistant to the Chief Engineer, where he remained until his recent promotion.

C. H. Andrus, General Foreman at West Philadelphia, Pa., has been appointed General Locomotive Inspector, with office at Altoona.

Pittsburg & Lake Erie.—G. M. Campbell, Electrical Engineer, has resigned to become Assistant Superintendent of the Western Electric Co., at Chicago.

Wabash.—E. F. Needham, Master Mechanic at Fort Wayne, Ind., has been appointed Master Mechanic at Springfield, Ill., succeeding C. H. Doebler, resigned. G. W. Smith, General Foreman at Fort Wayne, succeeds Mr. Needham.

LOCOMOTIVE BUILDING.

George Cousin, Louisiana, has ordered one 20-ton Shay locomotive from the Lima Locomotive & Machine Co.

The Kaul & Hall Lumber Co., Pennsylvania, has ordered one 65-ton Shay locomotive from the Lima Locomotive & Machine Co.

The Lake Champlain & Moriah has ordered one simple consolidation locomotive from the Baldwin Locomotive Works for April 1 delivery. The total weight of this locomotive will be 207,000 lbs., with 175,000 lbs. on drivers; cylinders, 22 in. by 28 in.; diameter of drivers, 50 in.; straight top boiler, with a working steam pressure of 200 lbs.; total heating surface, 3,298 sq. ft.; 406 tubes, 2 in. in diameter by 14 ft. 9 in. long; firebox, 114 in. by 72 in.; grate area, 57 sq. ft.; tank capacity, 5,500 gallons, and coal capacity, six tons. The special equipment will include Westinghouse air-brakes, Pneumatic bell ringer, Magnesia boiler lagging, Tower couplers, Schroeder headlights, Sellers injectors, United States piston rod and valve rod packing, Leach sanding devices, Detroit sight-feed lubricators, Railway Steel Spring Company's springs, and Walschaert valve gear.

The Central of Georgia, as reported in our issue of March 23, has ordered 25 simple consolidation freight (2-8-0) locomotives, 10 simple Pacific passenger (4-6-2) locomotives, and five six-wheel simple switching (0-6-0) locomotives from the Baldwin Locomotive Works, all for October and November delivery. Fifteen of the consolidation locomotives will weigh 156,940 lbs., with 140,740 lbs. on the drivers; cylinders, 20 in. x 28 in.; diameter of drivers, 56 in.; wagon top boiler, with a working steam pressure of 200 lbs.; heating surface, 2,209.3 sq. ft.; 271 Detroit steel tubes, 2 in. in diameter and 14 ft. 8 in. long; carbon wide firebox, 96⅛ in. x 66⅛ in.; grate area, 44.1 sq. ft., and tank capacity, 6,000 gallons. The other 10 consolidation locomotives will weigh 197,750 lbs., with 176,650 lbs. on the drivers; cylinders, 22 in. x 30 in.; diameter of drivers, 57 in.; straight top boiler, with a working steam pressure of 200 lbs.; heating surface, 3,517 sq. ft.; 403 Detroit steel tubes, 2 in. in diameter and 14½ ft. long; wide carbon firebox, 108 in. x 71¾ in.; grate area, 53 sq. ft.; tank capacity, 7,500 gallons, and coal capacity, 12½ tons. The Pacific locomotives will weigh 184,200 lbs., with 117,700 lbs. on the drivers; cylinders, 20 in. x 28 in.; diameter of drivers, 68 in.; straight top boiler, with a working steam pressure of 200 lbs.; heating surface, 3,357.5 sq. ft.; 280 Detroit steel tubes, 2¼ in. in diameter and 19 ft. 5 in. long; wide carbon firebox, 102⅜ in. x 66 in.; grate area, 46.8 sq. ft.; tank capacity, 7,500 gallons, and coal capacity, 12½ tons. The switching locomotives will weigh 145,800 lbs.; cylinders, 20 in. x 26 in.; diameter of drivers, 50 in.; wagon top boiler, with a working steam pressure of 185 lbs.; heating surface, 2,473 sq. ft.; 300 Detroit steel tubes, 2 in. in diameter and 15 ft. 1½ in. long; carbon wide firebox, 65⅛ in. x 65¼ in.; grate area, 29.68 sq. ft., and tank capacity, 4,000 gallons. The special equipment for all includes: Westinghouse air-brakes, Gollmar bell ringer, magnesia boiler lagging, Simplex brake-beams for 15 consolidation and switching locomotives, and Diamond Special brake-beams for the other locomotives, Perfecto and Lappin brake-shoes, Tower couplers, Pyle-National headlights for consolidation and Pacific locomotives and Dressel headlights for switching locomotives, Nathan Simplex injector, Ajax journal bearings, U. S. piston and valve rod packings, Ashton safety valves and steam gages, Leach sanding devices for consolidation and Pacific locomotives, and Economy sanding devices for switching locomotives, Nathan sight-feed lubricators, Railway Steel Spring Co.'s springs and Gold steam heat equipment for Pacific locomotives. Other specialties are: Miner gravity side bearings for consolidation and Pacific locomotives, Linstrom tank valve fixtures, Philip's double boiler checks, Elvin driving box lubricators for consolidation and Pacific locomotives, Bordo blow-off cocks for consolidation and switching locomotives, Homestead blow-off cocks for Pacific locomotives, and Westinghouse friction draft gear for consolidation and Pacific locomotives.

CAR BUILDING.

The Tacoma & Eastern Lumber Co. is building 50 logging cars at its own shops.

The Chicago Great Western, it is reported, is in the market for additional freight equipment.

The Canadian Northern has ordered six standard second-class tourist cars from Rhodes, Curry & Co.

The Hastings Express Co., Chicago, has purchased two furniture cars from Robert M. Burns & Co., Chicago.

The Mexican International has ordered 100 box cars of 80,000 lbs. capacity from the American Car Co. for 1906 delivery.

The Minnesota Land & Construction Co., Duluth, Minn., has ordered 75 logging cars from the Russell Wheel & Foundry Co.

The National of Mexico, as reported in our issue of March 9, has ordered 300 box cars of 80,000 lbs. capacity from the American Car Co., for 1906 delivery.

The Mobile & Ohio, it is reported, has ordered 600 freight cars of 60,000 lbs. capacity and 10 furniture cars of 60,000 lbs. capacity from the American Car & Foundry Co.

The Los Angeles & Redondo is building 10 interurban cars and 10 flat cars of 80,000 lbs. capacity at its Redondo shops. The interurban cars will be 44 ft. 6 in. long by 8 ft. 3 in. wide over all.

The Great Lakes Coal Co. has ordered 15 flat cars of 60,000 lbs. capacity from the Erie Car Works. These cars will weigh about 23,000 lbs., and measure 35 ft. long and 8 ft. 8 in. wide, over all.

The Atchison, Topeka & Santa Fe has ordered 1,000 box cars and 60 baggage cars from the American Car Co., 100 ballast cars from the Rodger Ballast Car Co., and 200 flat cars from the Pressed Steel Car Co.

The Lake Champlain & Moriah has ordered 25 steel "Jimmy" cars from the Pressed Steel Car Co. These cars will weigh 4,500 lbs. each and will have a capacity for 19 tons. The dimensions are 10 ft. long by 6 ft. wide by 6 ft. 9 in. wide inside. The bodies and underframes are of metal. The special equipment includes Monarch couplers.

The Chicago, Burlington & Quincy is considering the purchase of 17 additional chair cars. These cars are estimated to weigh about 110,500 lbs. each, and to measure 69 ft. 6 in. long by 9 ft. wide by 9 ft. 6 in. high, inside measurements. The special equipment will include the Chicago, Burlington & Quincy bolsters, brake-beams, brasses and trucks.

The Nashville, Chattanooga & St. Louis is receiving bids for 500 standard 36-ft. 60,000 lbs. capacity box cars, and will in the near future commence on an order of 500 standard 36-ft. 80,000 lbs. capacity flat bottom drop door coal cars, to be built at its own shops. These cars will be duplicates of previous cars of this type built at these shops during the past three years, specifications of which have from time to time been printed in the *Railroad Gazette*.

The Stockton Electric Railroad, Stockton, Cal., has ordered 40 cars from the St. Louis Car Co., for April delivery. These cars will be 33 ft. 6 in. long, 11 ft. 10½ in. wide, and 11 ft. 7 in. inside measurements. The special equipment will include the Brill axles, bolsters, brake-beams, brake-shoes, brakes, brasses, journal boxes, springs and trucks; St. Louis car couplers and curtain fixtures, Pantasote curtain material, Valentine paint, Monitor roofs, and Griffin car wheels.

The United Railways & Electric Co., Baltimore, has ordered 100 double-truck semi-convertible cars from the J. G. Brill Co. These cars will have a seating capacity for 44 passengers. They will weigh 45,000 lbs. and will measure 29 ft. 9½ in. long by 8 ft. 2 in. wide inside. The bodies and underframes will be of wood. The special equipment will include American Brake-Shoe & Foundry Company's brake-shoes, Van Dorn couplers, Keeler curtain fixtures, Pantasote curtain material, Valentine paint, Monitor roofs, and Griffin car wheels.

The Georgia Southern & Florida is building 500 flat cars of 60,000 lbs. capacity at its Macon, Ga., shops, for November delivery. These cars will weigh 26,500 lbs. and measure 40 ft. long and 9 ft. wide, over all. The special equipment includes: J. R. Johnston Co.'s steel axles, American cast-steel body bolsters and Simplex truck bolsters, Simplex brake-beams, Westinghouse air-brakes, Ajax brasses, Climax couplers, Miner tandem draft rigging, Symington journal boxes, Sherwin-Williams paint, Railway Steel Spring Co.'s springs, arch-bar metal trucks and Decatur wheels.

The British Columbia Electric Railway Co., New Westminster, B. C., will build 20 cars at its New Westminster shops. Eighteen will be for passenger service and two for freight service. The passenger cars will be of the Narragansett type and will have a seating capacity for 48 persons. They will weigh 19 tons each, and will measure 30 ft. 2 in. long by 7 ft. 2⅞ in. wide by 8 ft. 4¾ in. high, all inside dimensions. The bodies and underframes will be of wood and metal. The special equipment will include Brill trucks, National Wheel Company's wheels, and Pantasote curtain material.

The Alabama Great Southern, as reported in our issue of March 23, is in the market for 1,000 box cars of 60,000 lbs. capacity, 250 self-clearing steel hopper coal cars of 100,000 lbs. capacity, 250 40-ft. flat cars of 80,000 lbs. capacity, 250 drop bottom coal cars of 80,000 lbs. capacity, and 250 drop bottom coke cars of 60,000 lbs. capacity. The box cars will be 36 ft. long, 8 ft. 6 in. wide and 8 ft. high, inside measurements. The steel hopper coal cars will be 30 ft. long and 9 ft. 6 in. wide, inside measurements. The drop bottom coal cars will be 37 ft. 8 in. long, 8 ft. 5 in. wide and 45 in. high, inside measurements. The coke cars will be 39 ft. 4 in. long, 8 ft. 3 in. wide and 6 ft. 10¼ in. high, inside measurements. The special equipment for all of these cars are the same as for the Cincinnati, New Orleans & Texas Pacific reported in our issue of this week.

The Cincinnati, New Orleans & Texas Pacific, as reported in our issue of March 23, is in the market for 1,250 hopper cars of 60,000 lbs. capacity, 1,000 box cars of 60,000 lbs. capacity, 250 40-ft. flat cars of 80,000 lbs. capacity, 250 drop bottom coal cars of 80,000 lbs. capacity, and 250 drop bottom coke cars of 60,000 lbs. capacity. The hopper cars will be 25 ft. 7¼ in. long and 7 ft. 7 in. wide, inside, and 9 ft. 2⅝ in. high, over all. The box cars will be 36 ft. long, 8 ft. 6 in. wide and 8 ft. high, inside measurements. The coal cars will be 37 ft. 8 in. long, 8 ft. 5 in. wide and 45 in. high, inside measurements. The coke cars will be 39 ft. 4 in. long, 8 ft. 3 in. wide and 6 ft. 10¼ in. high, inside measurements. The special equipment for all will include: Buffalo brake-beams, Westinghouse air-brakes, R. E. Janney couplers, Jones doors for box cars, Miner tandem draft rigging, Harrison dust guards, Symington journal boxes, Chicago roofs for box cars, Pittsburg springs and arch-bar trucks.

BRIDGE BUILDING.

BIRMINGHAM, ALA.—The bids recently submitted for building nine steel bridges in Jefferson County have all been rejected by the Board of Revenue and new ones will shortly be asked. H. W. Cook is a member of the board.

BRANDON, MAN.—The Railway Commission has granted permission to the Brandon, Saskatchewan & Hudson Bay to build a bridge over the Souris river near this place.

DOAKTOWN, N. B.—Amasa Killam, bridge inspector of the Intercolonial Railway, has decided on a new steel structure, 160 ft. long, to replace the present bridge here.

HAZELHURST, MISS.—Bids are wanted April 2 by J. H. Long, County Clerk, for building a steel bridge 120 ft. long over Saddlers creek in Copish County.

JOLIET, ILL.—Representatives of six railroads entering Joliet have signed an agreement that work will be started within 30 days, as provided in an ordinance passed in January, for elevating the tracks through the city, at a cost of about $3,000,000.

LONDESBORO, ONT.—A steel bridge is to be built over the Mailland river here. James Campbell may be addressed.

LONDON, ONT.—A new steel bridge will be erected between the townships of Caradoc and Lobo, in Middlesex County.

MEDICINE HAT, ALB.—The Alberta Government will provide $50,000 this year to build the abutments and foundations for a highway bridge over the Saskatchewan river at this place. Mayor Forster may be addressed.

MILWAUKEE, WIS.—Work on the new Grand avenue viaduct is to begin early in May. Funds amounting to $450,000 will shortly be available for this purpose.

MONTANA.—A bill has been introduced in the House of Representatives and was passed by the United States Senate on March 23, authorizing a bridge across the Yellowstone river, in Custer County, Montana.

MONTCLAIR, N. J.—The Delaware, Lackawanna & Western has agreed to begin work shortly on a viaduct to carry its tracks over Bloomfield avenue. The cost of the work will be about $60,000, one-half of which is to be paid by the railroad and the balance by the street railroad and the county.

MONTREAL, QUE.—The Harbor Board has consented to the building of a new highway bridge from Commissioner's street to Victoria pier, to cost $11,000.

PEORIA, ILL.—Work is soon to be started on a proposed bridge over the Illinois river at the foot of Walnut street.

PINE BLUFF, ARK.—A site is being selected for building the proposed highway bridge over the Arkansas river at this place.

PINKERTON, ONT.—Sealed bids will be received by J. J. Donnelly, clerk township Greenock, for the erection of a 90-ft. span, 14-ft. roadway, Warren truss steel bridge over the Teeswater river, side line 5, township of Greenock; also for the erection of a 110-ft. steel bridge over the Teeswater river, concession 8, Greenock. Plans to be submitted by parties tendering.

PORTAGE LA PRAIRIE, MAN.—The Midland Railway has submitted plans for a steel bridge, 400 ft. long, to be built over the Assiniboine river at this place.

PROVIDENCE, R. I.—Application has been made to the War Department by the New York, New Haven & Hartford for permission to build a drawbridge over the Seekonk river between the Twin Line and Red bridge.

SOUTH DAKOTA.—A bill was passed by the United States Senate on March 23, and is before the House of Representatives, authorizing a bridge across the Missouri river between the counties of Walworth and Dewey, S. Dak.

TACOMA, WASH.—Bids are wanted April 6 by the Board of County Commissioners of Pierce County for building the Crocker

bridge near Crocker, in Pierce County. I. M. Howell is County Auditor.

Tuscaloosa, Ala.—Negotiations are under way for building a bridge 400 ft. long over the tracks of the Alabama Great Southern on Second avenue.

Washington.—The United States Senate on March 23 passed bills authorizing bridges across the Columbia river between the counties of Franklin and Benton, and between Douglas and Kittitas; and across the Snake river between the counties of Whitman and Columbia, in the state of Washington. Bills authorizing the two bridges across the Columbia have also been introduced in the House of Representatives.

Winnipeg, Man.—The City Engineer has been asked to report on the cost of a steel overhead bridge over the Canadian Pacific tracks.

Other Structures.

Chicago, Ill.—Announcement has been made that the Chicago, Milwaukee & St. Paul will shortly begin work on large additions to its Chicago shops.

Huntington, L. I.—The Long Island has bought ground as a site for a new passenger station.

Omaha, Neb.—Work is to be started at once by the Union Pacific improving its passenger terminals at a cost of $150,000.

Rochester, Pa.—Plans have been completed for additional improvements to be made by the Pennsylvania to its yards at Conway. The work includes the building of an additional roundhouse with a radius of 187 ft., with stalls for 41 engines. An outside turntable will also be put in, and a coaling station and ashpits for handling 150 engines a day; and a large storehouse and office building, two stories high.

St. Louis, Mo.—The Wabash, it is said, has bought eight city blocks as a site for new freight yards.

Tampa, Fla.—The Tampa Terminal Co. has been organized to build terminals for the Seaboard Air Line on Grassy Island at the mouth of Hillsboro river, at a cost of about $300,000. Work is to be started shortly.

RAILROAD CONSTRUCTION.

New Incorporations, Surveys, Etc.

Alaska Central.—This company, which is building a line from Seward, on Resurrection Bay, north to Fairbanks, 490 miles, has completed 49 miles of road, and 25 miles of the line is now in operation. The company will put a large force of men at work this year on the road. The extension will be through a rich mineral, coal and timber section.

Alberta & Flathead.—Application has been made to the Dominion Parliament by A. C. Kommis, of Pincher Creek, Alb., for permission to incorporate a company under the above name to build a railroad from a point on the Crow's Nest branch of the Canadian Pacific, near Pincher station, to the Waterton Lakes; thence to the eastern boundary of British Columbia at Flathead river, and up that river to its source. Also for permission to build branches not to exceed 40 miles in length.

Atchison, Topeka & Santa Fe.—This company has had the charter of the Jasper & Eastern amended, permitting it to extend and build a branch line from a point between De Ridder and Alexandria, on the main line of its projected road in the Parish of Vernon, La., southeasterly through Vernon, Rapides and Calcasieu parishes, to a point on the St. Louis, Watkins & Gulf, between Woodworth and Oberlin, approximately 30 miles.

Bowling Green & Western.—Incorporation has been granted a company under this name in Kentucky to build a railroad from Bowling Green to Horsebranch, where a connection will be made with the Illinois Central. Surveys have been completed and construction work is to be started about the first of June. The road will traverse a rich coal and mineral section. The directors include: J. T. Sweeney, A. H. Taylor, of Bowling Green; W. A. Helm and J. M. Carson, of Morgantown.

Brooklyn Rapid Transit.—The New York City Rapid Transit Commission has formally approved the plans to build a subway to Coney Island, as an extension of the Fort Hamilton route. The line will run from Atlantic and Flatbush avenues, in Brooklyn, through Fourth avenue to 40th street, New Utrecht avenue to 86th street; at a point between 23d and 24th avenues it will reach the surface and run on an elevated structure through Stillwell avenue to Coney Island.

Canadian Northern.—This company intends to build this year the first link in the Hudson Bay line, an extension 92 miles long from Etoimian, on the Prince Albert branch, northeast to The Pass. The extension will run through the Carrot river country, one of the best wheat regions in Canada. It will probably be completed, next year, to Fort Churchill, on the west coast of Hudson Bay.

Two branches each 25 miles long from the main line, which now reaches Edmonton, will be built this year.

Canadian Pacific.—Sub-contracts for grading 80 miles of this company's line between Strassburg and Saskatoon will shortly be let. The British Columbia Contract Co., of Vancouver and Calgary, of which George H. Webster is manager, can furnish information.

Contract has been given by this company to J. D. MacArthur, of Winnipeg, for building 40 miles of its Wolseley-Reston branch, also for building the Winnipeg Beach line extension.

This company is asking bids for building the Stonewall-Manitoba branch and for straightening the main line on the Medicine Hat division.

This company, it is said, proposes to build a line to Portland, Me., and surveys from the existing lines have been under way for some time. Negotiations are under way for securing a water front at South Portland.

Chicago, Milwaukee & St. Paul.—The city of Milwaukee, Wis., is reported to have passed an ordinance requiring this company to elevate its tracks in that city.

The City Council of Seattle, Wash., after deliberating more than two months, has granted the application of this company, permitting it to enter that city. According to the statement of an official, construction of the Washington division of the Pacific coast line will be started in Washington within the next two weeks.

Denver, Laramie & Northwestern.—This company was recently granted a charter in Colorado, with a capital of $5,000,000, and the first board meeting has been held, at Laramie, Wyo. The charter grants power to build a railroad from Denver, through Denver, Jefferson, Adams, Boulder, Walden and Laramie Counties, Colo., and through Albany, Carbon, Natrona, Fremont and Big Horn Counties in Wyoming, to the northern boundary of Wyoming—a total of about 450 miles. The directors say that they have no connection with other roads, and that the necessary funds to carry out the work have been secured. The officers are: S. Johnson, President; W. R. West, Vice-President; R. H. Dwyer, Second Vice-President and General Manager; S. Kent, Third Vice-President; J. O. Curry, Treasurer, and J. T. West, Secretary.

Edgewater Connecting.—See Missouri Pacific.

Erie, London & Tilsonburg (Electric).—Application has been made by this company for a charter to build an electric road from Port Burwell along the north shore of Lake Erie to London, Ont., 34 miles.

Galveston, Beaumont & Northeastern.—A charter has been granted a company under this name in Texas, with a capital of $100,000, and with office at Beaumont. The company proposes to build a railroad from Beaumont, through the counties of Jefferson, Orange, Jasper and Newton, to a point on the Sabine river in the northeast corner of Newton County. The incorporators are T. E. Meece, C. S. Marshall, B. I. Sparks, C. H. Moore, M. Stuart, K. Moore, of Galveston, and E. H. Greer, Jr., of Beaumont.

Gulf & Ship Island.—See Mississippi Garden.

Gulf, Colorado & Santa Fe.—Notice has been filed by this company that it will build about 500 miles of railroad in Texas. Under the charter of the Pecos & Northern Texas, plans have been made for a branch line from a point on the main line in Parmer County, near the western boundary of the State of Texas, southeast to Brownwood, in Brown County, about 350 miles. Also for a branch from a point near Canyon, in Randall County, to the southern boundary of Lubbock County, an addition of 125 miles.

Hampton & Yorktown (Electric).—An officer writes that this company, incorporated in Virginia to build an electric road from Hampton to Yorktown, 19 miles, is now making surveys and will begin construction work as soon as financial arrangements which are now under way have been completed.

Hillsboro Northeastern.—Application has been made by this company, which operates five miles of road in Wisconsin, for permission to extend its line from Hillsboro, in Vernon County, west and southwest to Richland Center in Richland County, 28 miles.

Interurban.—This company has been incorporated in Ohio to build an electric line from South Lebanon east to Morrow, about five miles. The proposed line is to form a division of the Interurban Railway & Terminal Co.

Jasper & Eastern.—See Atchison, Topeka & Santa Fe.

Kamloops, Boundary & Cariboo.—Application has been made to

the Dominion Parliament by Pringle & Guthrie, Solicitors, of Ottawa, for permission to incorporate a company under the above name to build a railroad from the city of Grand Forks, in British Columbia, north, following the valley of the North Fork of the Kettle river to Franklin Camp and Fire Valley, and thence northwest to Grand Prairie.

KANSAS CITY, TULSA, TEXAS & GULF.—Bids are soon to be asked by this company, which was recently organized, for building a road from Kansas City to Matagorda, Tex. Negotiations are under way for land at the latter place for terminal and port facilities. D. B. Merry, of Tulsa, is Chief Engineer.

KENTUCKY VALLEY.—An officer writes that this road has been completed from Providence, Ky., via Montezuma to Wheatcroft, 10 miles, and that it was put in operation this month.

LOUISIANA ROADS.—The city of Monroe is building an electric line 6½ miles long. The Western Electrical Construction Co., of St. Louis, Mo., is doing the work. George Selman is City Engineer.

MEXICAN CENTRAL.—This company is planning to build a large terminal and secure port facilities at Manzanillo, on the completion of its line to that port. About 1,000 acres of land has been bought, a yard will be laid out and new shop buildings will be put up. The company has already built a sea wall along the harbor front for about one mile, and a breakwater for about half this distance. On the completion of its line it will have a direct connection to the port of Tampico. Part of the line from Calamena to Manzanillo will consist of an existing road recently bought from the National Construction Co., which is to be rebuilt.

MEXICO CITY ROADS.—The government railroads—the National, the Interoceanic, the International and the Vera Cruz & Pacific—have joined in an application to the federal authorities for a concession to build a belt railroad around Mexico City. The San Rafael & Atlixco Railroad Company is also interested in the project.

MISSISSIPPI CENTRAL.—This company has organized the Natchez & Eastern, in Mississippi, to build an extension from Brookhaven west to Natchez, about 70 miles.

MISSISSIPPI GARDEN.—Incorporation has been granted a company under this name in Mississippi to build a railroad from Hattiesburg north through Perry, Jones, Covington, Smith, Scott and Leake counties to Carthage. The incorporators are: G. A. Flater, of Toledo, Ohio; S. P. Floeter, of New Albany, Miss., and W. F. Floeter, of Taylorsville, Miss. This line is projected over the route that was selected by the Gulf & Ship Island for its road before it was decided to build to Jackson, and it is thought that the G. & S. I. is behind the project.

MISSOURI, KANSAS & TEXAS.—See New Orleans, Crowley & Western.

MISSOURI PACIFIC.—Under the name of the Edgewater Connecting, a charter has been granted a company in Kansas City, with a capital of $500,000, to build a line, two miles long, to connect the Missouri Pacific with the Chicago Great Western in Kansas City. B. T. Waggner and J. W. Orr, of Atchison, are directors.

The St. Louis, Iron Mountain & Southern has begun train service from Latour, Ark., south to McGehee, Ark., 81.76 miles. This part of the line will be known as the Latour District of the Memphis Division.

NATCHEZ & EASTERN.—See Mississippi Central.

NEW ORLEANS, CROWLEY & WESTERN.—This company has been recently incorporated to build a line from New Orleans to a point in Texas to connect with the Missouri, Kansas & Texas, which is supposed to be back of the project. The Franklin & Abbeyville road, 32 miles long, is to be taken over by the new company. W. F. Owen, formerly Superintendent of Morgan's Louisiana & Texas Railroad, is President of the company.

NORTH COAST.—It is said that this road, projected to run from Walla Walla, Wash., northwest through North Yakima to Seattle, has, through its promoter, Robert E. Strahorn, bought the Spokane-Columbia River & Navigation Co., which was started by farmers to build a line from Ringold Bar, Wash., on the Columbia river, northeast through Connell 153 miles to Spokane. Rights of way for the latter road have been secured, and grading has been completed for 26 miles. With this acquisition the construction of the North Coast into Spokane is believed to be insured. Connection with the new line will be made at Pasco, completing an additional line across the State of Washington.

NORFOLK & WESTERN.—The route of the proposed belt line to reduce the grades around Lynchburg, Va., which this company will build, is from Forest depot, on the main line, to Concord, about 23 miles. The new line will shorten the distance over the existing road about two or three miles, and will avoid the heavy grades at the Concord Hill.

OREGON RAILROAD & NAVIGATION.—This company is reported having authorized the rebuilding of its line from Troutdale, Ore., to Bonneville, 17 miles, to eliminate severe curves. Surveys are being made and contracts are to be let as soon as the surveys are completed.

OREGON SHORT LINE.—This company, it is said, will build a 20-mile extension of its Minidoka branch from its present terminus at Twin Falls, Idaho, to a new town called Buhl. Also a branch from a point half way between St. Anthony and Marysville on the Idaho Falls branch southeast, and three additional lines in Idaho, the routes of which have not yet been announced.

PACIFIC & EASTERN.—Application has been made to the Dominion Parliament by Belcourt & Richie, of Ottawa, for incorporation of this company, to build a railroad from Victoria, B. C., to the northern end of the island of Vancouver, thence to Bute Inlet and east through the district of Cariboo via Yellow Head Pass to Edmonton, Alberta; thence continuing east to Prince Albert, Sask., and thence to Fort Churchill on Hudson Bay, with a branch from Edmonton northwest to Dungevan on the Peace river.

PECOS & NORTHERN TEXAS.—See Gulf, Colorado & Santa Fe.

PENNSYLVANIA.—Announcement has been made that the West Penn division of this road is to be improved at a cost of $3,500,000. The plans call for a large yard at Sharpsburg, to cost $2,500,000; the rebuilding of the line from Tunnelton to Blairsville, and the double-tracking of the remaining portion of the division. The ruling grade will be reduced from one per cent. to three-tenths of one per cent. Work on the Sharpsburg yard will be commenced as soon as litigation, now pending to secure some of the property, is concluded. The new line will form part of a two-track low-grade line from Bolivar to Allegheny, 75 miles. Additional bridges will be built over the Conemaugh. Contracts for this work are to be let early next month.

This company, it is said, has let contracts for improvements to be made in the Pitcairn yards, to cost $2,000,000. The work includes about 60 miles of new track and two large storage sheds, each 1,000 ft. long. It calls for the excavation of about 800,000 yards of earth, the laying of 10,000 yards of masonry, and 20,000 yards of foundation excavation.

PHILADELPHIA & WESTERN.—See Philadelphia Rapid Transit.

PHILADELPHIA RAPID TRANSIT.—The arrangement between this company and the city of Philadelphia for the relinquishment by the company of its rights in certain streets and the immediate construction of elevated or subway lines in other streets, which was noticed in the *Railroad Gazette* last week, page 88, General News Section, is said to have been practically agreed upon, and it was expected that the necessary ordinance would be signed this week. The engineering force of the Rapid Transit Company is working night and day on the plans for the subway in Broad street and for the elevated line to Frankford. Under the terms of the agreement these plans must be ready by June 1, and work must be begun within a month after they are approved by the city authorities. The Philadelphia & Western, whose application for a franchise was also noted last week, has made no further announcement concerning its plans.

ROCKFORD RAILROAD.—Incorporation has been granted this company in Illinois, with a capital of $10,000, to build a belt line in the city of Rockford. The office of the company is at Chicago, and the incorporators are B. F. Lee, A. F. Humburg, S. F. Andrews, C. E. Foreich and W. E. Claflin, of Chicago.

SOUTHERN.—This company is reported making surveys near its Nashville division between Monterey and Harriman, Tenn., for the construction of short lines into the coal fields of that district. Preliminary surveys have been completed from Crossville to a point on the Big Laurel river, 20 miles.

TEXAS, NEW MEXICO & PACIFIC.—The Rock Island Construction Co., which has the general contract to build this road, has sublet some of the work to Callahan & Frye, who are to begin work within a month. The graders will begin at McKinney, and work west, and it is expected to have the line completed to Bridgeport or to some point on the western boundary of Wise County within one year. (See Construction Record).

TEXAS RAILWAY.—This company has been organized in Texas, with office at San Antonio and a capital of $1,000,000, to build a railroad from San Antonio southeast to Port O'Connor, on Matagorda Bay, 210 miles, with a branch from Yoakum to La Grange, 32 miles. The incorporators include Samuel Granat, of New York City; Joseph Faust, Harry Landa, William Clemens, of New Braunfels, Texas; John Sullivan, of Oklahoma City, Okla.; J. P. Barclay, M. Goggan, William Aubrey, W. W. Lipscomb, M. Hicks, T. L. Conroy, W. C. Rigsby, C. H. Florian and M. S. Blackburn, all of San Antonio; B. N. Peck, of Gonzales; W. L. Johnson and Ed B. Caruth, of Yoakum.

TEXAS ROADS.—Plans are being made by Charles M. Schwab

and other eastern capitalists to build a railroad from Vernon, Tex., to Roswell, N. Mex., about 365 miles. J. E. Lutz, of Vernon, Tex., is the local representative. Temporary surveys have been made.

Tidewater.—Announcement has been made by Raymond DuPuy, General Manager of this road, that the company has bought four acres of land on Main and Bermuda streets, in Norfolk, Va., adjoining the freight terminals of the Norfolk & Western. This will be used as a site for a passenger station and freight yards.

Vicksburg, Natchez & Gulfport.—Application has been made by this company for a charter in Mississippi to build a railroad from Vicksburg southeast to Gulfport, about 225 miles, with a branch from Natchez east through the counties of Adams, Franklin, Amite and Pike to a junction with the main line, an additional 100 miles.

Western Pacific.—The Los Angeles (Cal.) City Council has granted a franchise allowing a steam railroad permission to lay tracks from the eastern limits of the city along the Los Angeles river to Aliso street. It is surmised that the Western Pacific is behind the application.

Yosemite Valley.—This company has completed grading on a large part of its road from Merced, Cal., northeast about 60 miles, to the Yosemite Valley, and will have all but 12 miles of track laid early this summer.

RAILROAD CORPORATION NEWS.

Allegheny Valley.—The stockholders at their recent meeting refused to approve the proposed merging of the company with the Pennsylvania. (March 9, p. 80).

Atchison, Topeka & Santa Fe.—Gross earnings for the month of February were $6,487,557, which compares with $4,669,306 during the same month of 1905, and $5,346,860 in 1904.

Aurora, Elgin & Chicago (Electric).—Under the above name the Elgin, Aurora & Southern, the Aurora, Elgin & Chicago, and the Cook County & Southern have been merged. The total length of the lines is 150 miles, and the new company will be capitalized at $6,200,000. The $1,500,000 6 per cent. cumulative preferred stock of the old Aurora, Elgin & Chicago will be exchanged for $1,800,000 new cumulative preferred stock, and the $3,000,000 common stock will be exchanged for the same amount of new common stock. Every 100 shares of the $2,000,000 stock of the E., A. & S. will be exchanged for 65 shares of new preferred stock, and the $100,000 Cook County & Southern stock will be exchanged share for share for the new common. The new company will take up the $5,500,000 bonds of the old companies, issuing in exchange for them part of the new $25,000,000 5 per cent. bonds. The issue of these is to be voted on at a special meeting of the stockholders in the latter part of May.

Baltimore & Ohio.—Gross earnings for the month of February were $5,802,508, an increase of $1,0b7,848.
See Washington Branch.

Chicago Great Western.—This company is to issue $1,000,000 additional 5-year notes for equipment purposes.

Darien & Western.—See Georgia Coast & Piedmont.

Georgia Coast & Piedmont.—Under this name the Darien & Western and the Reidsville & Southeastern are to be consolidated. (Oct. 6, p. 112).

Holly River & Addison.—See West Virginia Midland.

Hudson Valley (Electric).—The New York State Railroad Commission has authorized this company to increase its capital stock from $3,000,000 to $5,500,000. The increase is to provide for the conversion of the $2,500,000 2 per cent. non-cumulative debenture B bonds. When the company was reorganized recently, the holders of these debenture bonds were to have the right to convert them into 5 per cent. non-cumulative preferred stock two years from the date of issue.

Illinois Central.—This company has filed a notice of agreement with various roads showing the trackage rights by which it gets an entrance into Birmingham, Ala. The I. C. is to use the Mobile & Ohio tracks from Jackson, Miss., to Corinth. It will build 80 miles from there to Haleyville, Ala., from which point it will use the Northern Alabama tracks to Jasper, Ala., and from there the St. Louis & San Francisco tracks to Birmingham. The Mobile & Ohio will have trackage rights over the new Illinois Central line from Corinth to Haleyville, and the St. Louis & San Francisco will run trains over the Illinois Central from Baton Rouge, La., to New Orleans.

Indiana, Illinois & Iowa.—Gross earnings for the year ended December 31, 1905, were $1,812,462, an increase of $110,491; net earnings, $442,569, a decrease of $3,301. The surplus after dividends was $2,123, a decrease of $17,885, 4 per cent. having been paid on the $5,000,000 capital stock as compared with 3 per cent. in 1904. There were 219 miles of road operated, a decrease of 31 miles.

Lake Shore & Southern.—The annual report of this company shows that in the year ended December 31, 1905, it acquired $14,821,900 additional stocks and bonds of other railroads. The principal new acquisitions of stock are as follows: Cleveland, Cincinnati, Chicago & St. Louis, 75,287 shares, its holdings in this property now having a par value of $18,752,700; Indiana, Illinois & Iowa, 1,274 shares, the Lake Shore now owning the entire $5,000,000 outstanding stock of this company; Detroit & Chicago, $1,000,000; Mahoning Coal R. R. common, $865,900; Mahoning Coal R. R. preferred, $399,500; North Central Michigan, 598,500; Jamestown & Franklin, $583,350; Franklin & Clearfield, $555,000; Indiana Harbor Railroad of Illinois, $500,000; Indiana Harbor Railroad of Indiana, $425,000; Detroit, Monroe & Toledo, $414,100; Sturgis, Goshen & St. Louis, $300,000; Kalamazoo & White Pigeon, $230,900; Elkhart & Western, $229,900; and East Chicago Belt Railroad, $100,000. The total par value of stocks owned or acquired under lease by the Lake Shore is $104,671,200, as compared with $90,847,300 in 1904, an increase of $13,823,900. The Lake Shore also acquired last year $200,000 Elkhart & Western first mortgage bonds, $298,000 Jamestown & Franklin first mortgage bonds, and $500,000 Jamestown & Franklin second mortgage bonds. The total par value of the bonds held by the Lake shore is $1,527,000, as compared with $529,000 in the previous year. The grand total of the par value of the stocks and bonds owned by the company is $106,198,200, carried on the books of the company at a total value of $77,892,988, as compared with a total par value in 1904 of $91,376,300, carried on the company's books at $63,019,898. The company's income from dividends and interest increased $815,906.

New York, Chicago & St. Louis.—J. P. Morgan & Co., New York, have bought an issue of $10,000,000 4 per cent. debenture bonds of 1931. The proceeds of the sale of these will be used to buy equipment and for improvements and other purposes. This issue makes the total funded debt $29,425,000, excluding $426,000 equipment notes.

New York, New Haven & Hartford.—This company has been given authority to increase its capital stock from $100,000,000 to $140,000,000. The new stock, when issued, will be used for the conversion of $30,000,000 3½ per cent. debenture bonds of 1911, at the rate of $150 of debenture bonds for $100 of stock at par. The rest is to be exchanged for the capital stock of acquired companies. There is now $80,221,800 stock outstanding, and application has been made to the New York Stock Exchange to list an additional amount, making the total $89,286,300.

Norfolk & Southern.—See Virginia & Carolina Coast.

Pennsylvania.—See Allegheny Valley.

Texas & Pacific.—Gross earnings for the year ended December 31, 1905, were $12,130,391, a decrease of $302,756; net earnings, $3,504,225, a decrease of $817,230. The surplus after charges was $1,203,042, an increase of $44,303.

Virginia & Carolina Coast.—This company is to have $25,000,000 capital stock and $25,000,000 bonds. It has just acquired the Norfolk & Southern, and its holdings are now as follows: Norfolk & Southern, running from Norfolk, Va., to Edenton, N. C., having, including branches, 223 miles of road; it has $2,000,000 capital stock, $1,655,000 first mortgage 5 per cent. bonds of 1941, and $2,790,000 first general mortgage 5 per cent. bonds of 1954 outstanding; the Suffolk & Carolina, running from Suffolk, Va., to Edenton, N. C., 75 miles; and the Pamlico, Oriental & Western under construction from New Bern, N. C., to Goose Creek, 38 miles. New construction is planned which is to make the total mileage of the Virginia & Carolina Coast about 600.

Washington Branch.—The state of Maryland has, through the Board of Public Works, accepted the offer of $2,500,000 made by the Baltimore & Ohio for the 5,500 shares of Washington Branch stock which the state holds. It is probable that the intended investigation by a state legislative committee of the disposition by the Baltimore & Ohio of Washington Branch earnings will now be dropped.

West Virginia Midland.—This company, which was incorporated last year, with a capital of $500,000, to build from Sutton, W. Va,. to Marlinton, about 50 miles, has bought the entire property of the Holly River & Addison, and will operate it, beginning April 1, without immediate change in its officers. The H. R. & A. runs from Holly Juncton, W. Va., to Webster Springs, 30 miles, and has a four-mile branch. There is $200,000 stock outstanding and $200,000 first mortgage 5 per cent. bonds of 1922.